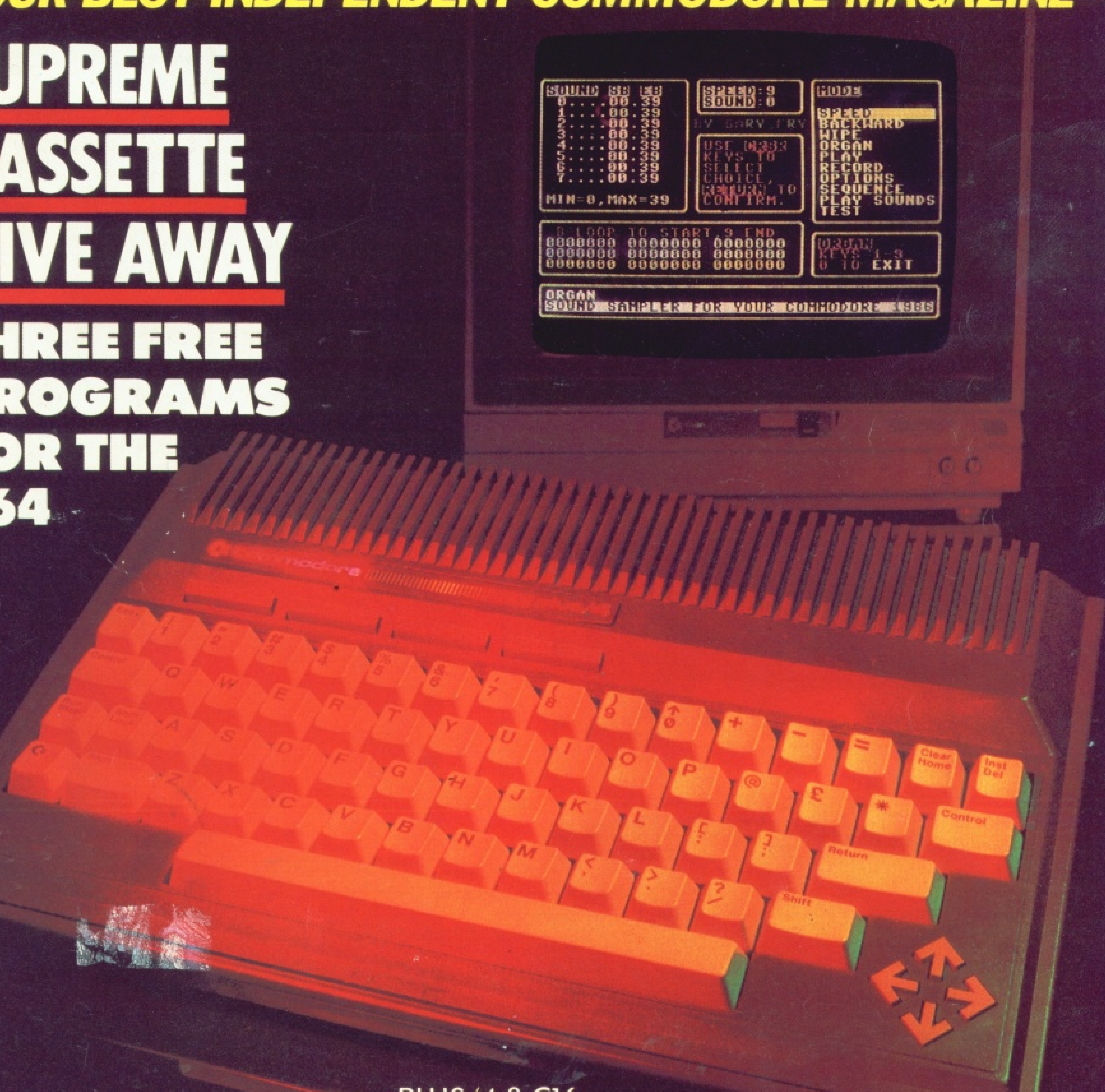
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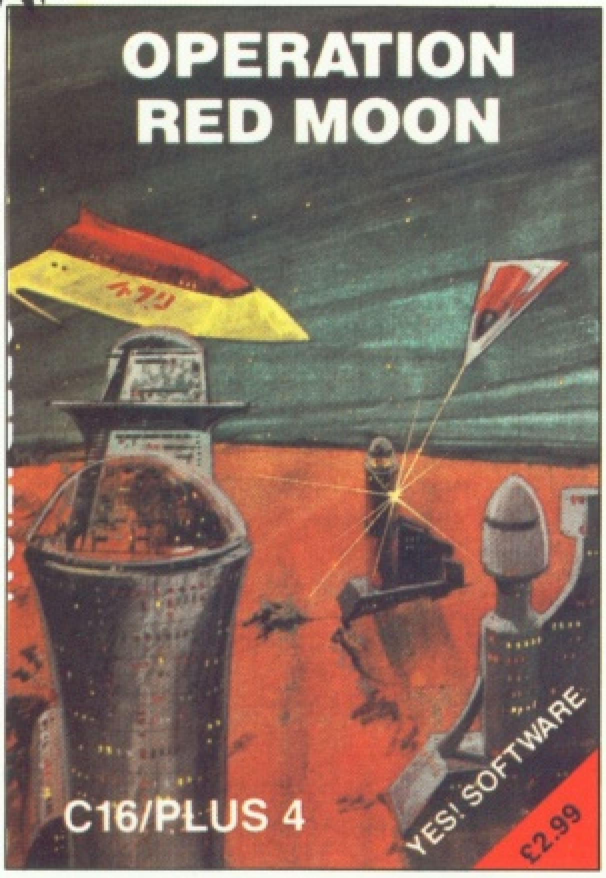
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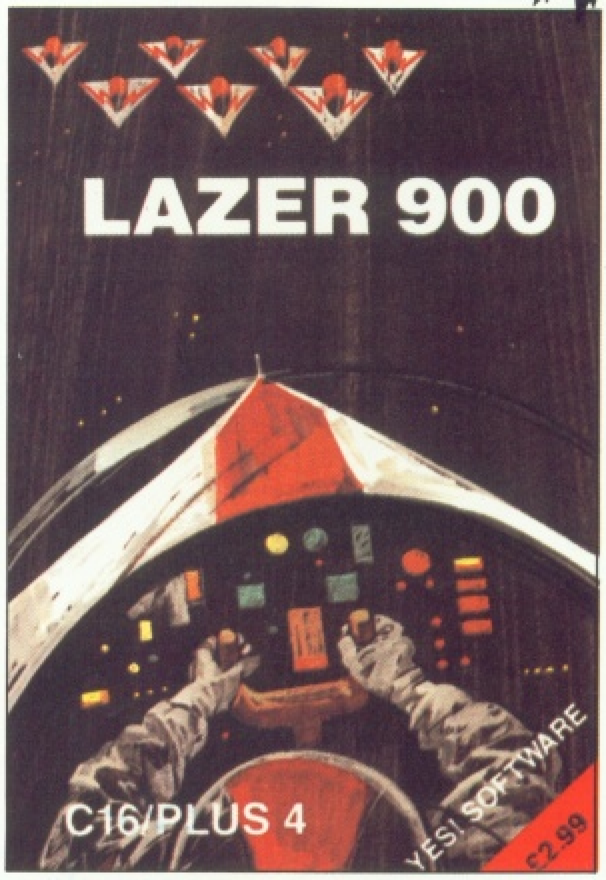
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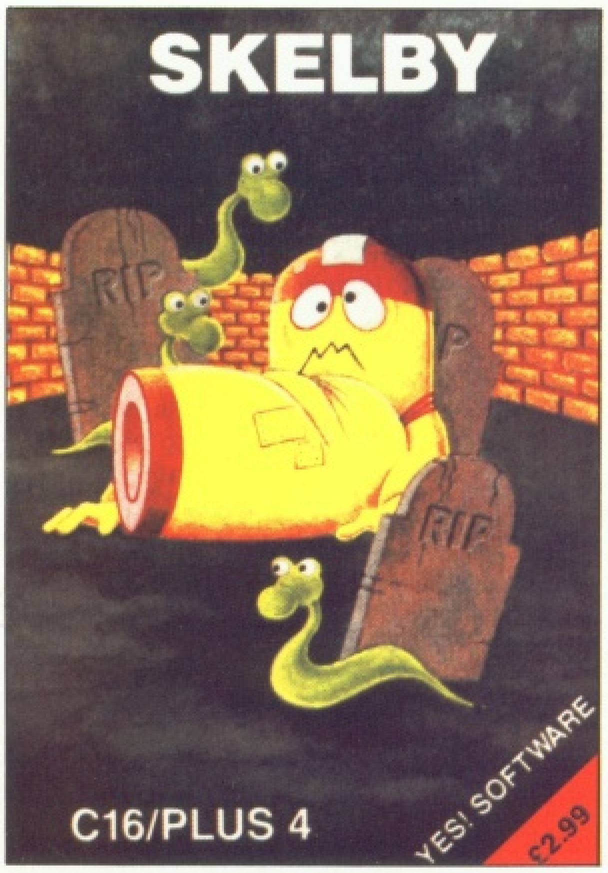
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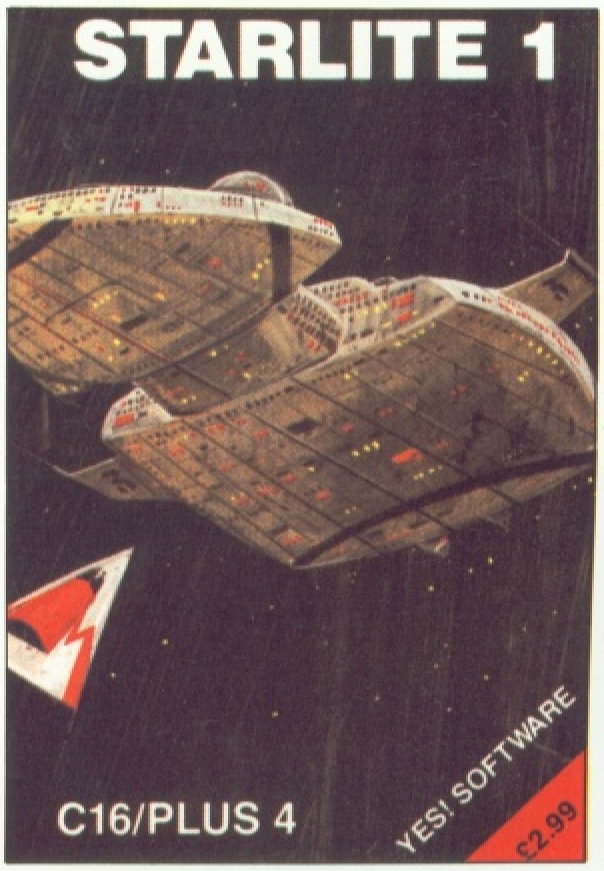
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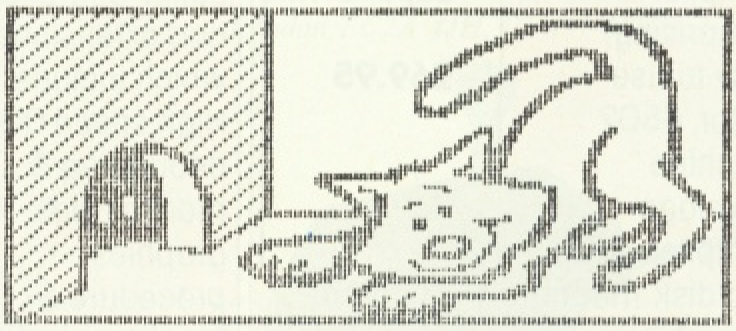
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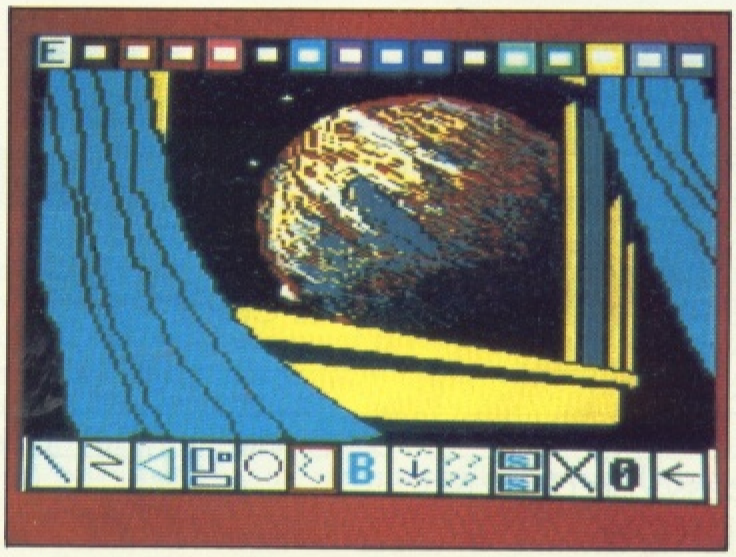




GAMES AND UTILITIES

FEATURES





DATA STATEMENTS

Soft in the Head

Straight in, with news of two new Bubble Bus games for the C16/Plus 4. The first is *Trizons* an addictive 3D split screen scrolling game with more than a dozen aliens against which to pit your wits. The second is *Tazz*. Tazz is sent from a company with the confidence-inspring name of Bug Exterminators Unlimited/Unreliable. You must gatecrash a party where wild butterflies and razor sharp scythes are on the loose. Both are in the shops now and cost £2.99.

Alpha-Omega has just announced two new titles for the Commodore 64. These are *Gods and Heros* and *Aftermath.*

Gods and Heroes is a platform game and will cost £1.99. The game features 50 challenges taken from Greek mythology. You must see if you are as resourceful and courageous as the ancient heroes.

Aftermath is a game about revenge. The Final Conflict has been lost and the barren plains of a devastated earth lie before you, the Saurans rule the planet. Penetrate the Sauran defences and destroy their Strategic Command with a single bomb and so give meaning to your life and your death. *Aftermath* is also £1.99.

If your collection of Beyond software games is incompletge then you may like to know that there is now a Beyond compilation tape for the C64. Entitled *The Best of Beyond*, the Commodore version of the tape costs £9.95 and contains such classics as *Shadowfire, Enigma Force, PSI Warrior* and *Quake Minus One.*

TOUCHLINE
Beyond: *Wellington House, Upper St Martins Lane, London WC2H 9DL. 01-379-5683.*
Alpha-Omega: *9 King's yard, Carpenter's Road, London E15 2HD. 01-985-6877.*
Bubble Bus: *87 High Street, Tonbridge, Kent TN9 1RX. 0732-355962.*

Magnum Force

Not content with budget software, Mastertronic is entering the hardware market with the Magnum Joystick. It is heralded by Mastertronic as a new generation joystick designed to meet the demands of new generation software. Features include instant posi-action response, floating activator, ergonomic design, hair action trigger, left or right hand usage, extra long cable and full compatibility.

TOUCHLINE
Mastertronic: *8-10 Paul Street, London EC2A 4JH. 01-377-6880.*



Label Lines

Melbourne House, a company which has managed to make a name for itself in this country, is now attempting to make a name for somebody else. Melbourne House is to be the sole UK and EEC distributor of Arcade Machine games. Arcade machine is a new company totally devoted to producing top quality arcade games.

Bazooka Bill is the first title on this new label. Bill, the central character, is armed with a whole arsenal of weapons including knives, a machine gun, flame thrower, bazooka and a missile firing jet fighter. Basically, all he has to do is fend off an endless stream of attackers (as many as 15 on one screen) using his weaponry.

Bazooka Bill is priced at £9.95 and is available for the C64.

Ariolasoft is launching two new home grown labels to deal with British software products: an arcade label called Reaktor and an adventure label called 39 Steps.

Deactivator will be the first game on the Reaktor label. Prices for C64 disk and cassette are £14.95 and £9.95 respectively. On the 39 Steps label will be *They Sold a Million* an adventure in which you have the opportunity to plan the perfect robbery. Disk is £14.95 and cassette is £9.95.

TOUCHLINE Melbourne House: *60 High Street, Hampton Wick, Kingston-Upon-Thames, Surrey KT1 4DB. 01-943 3911.*
Ariolasoft: *68 Long Acre, London WC2. 01-836-3411.*

Dangerous Games

In the dangerous world of adventures there's always room for refinement and improvement to add atmosphere and thrills to even the best game. With this in mind Rainbird has taken three classic Level 9 games, comprising the jewels of darkness trilogy, rewritten them and produced them on either three cassettes or one disk. For those who don't remember the three games in the triology are; *Collosal Adventure, Adventure Quest* and *Dungeon Adventure*. The price for either the three cassette pack or the disk is £14.95 and both are available now.

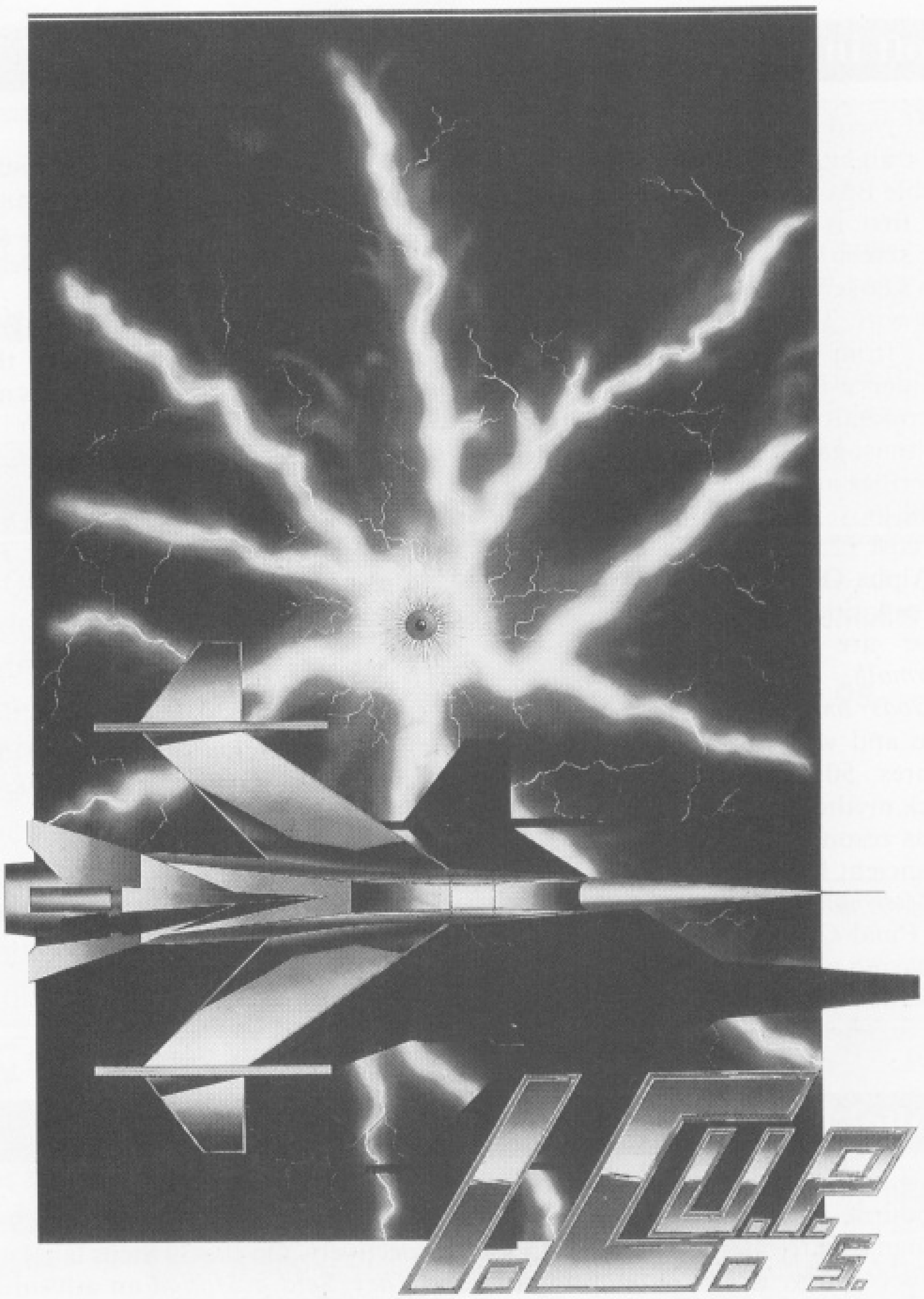
In infogrames latest adventure there is only one way in which you can get yourself out of poverty and into the world of the financially secure – win £1 million in one night in Las Vegas. The name of the game is *The Inheritance* – subtitled Panic in Las Vegas – and it's a three part adventure. First you must get out of your hotel, then make your way to the airport and thence to Las Vegas to win your £1 million. It's on cassette and costs £9.95.

One very popular cartoon concept which has never been transferred to computer is *The Adventures of Asterix the Gaul*. Melbourne House is about to put this right by releasing an Asterix adventure *The Magic Cauldron*. The game features all those well loved characters including Obelix, Getafix and of course Dogmatrix. In this adventure you must aid Asterix and

DATA STATEMENTS

Obelix in their quest to find the missing pieces of the magic cauldron.

TOUCHLINE
Rainbird: *First Floor, 74 New Oxford Street, London WC1A 1PS. 01-240-8838.*
Infogrames: *01-364-0123.*
Melbourne House: 60 High Street, Hampton Wick, Kingston, Surrey KT1 4DB. 01-942-3911.



New From Odin

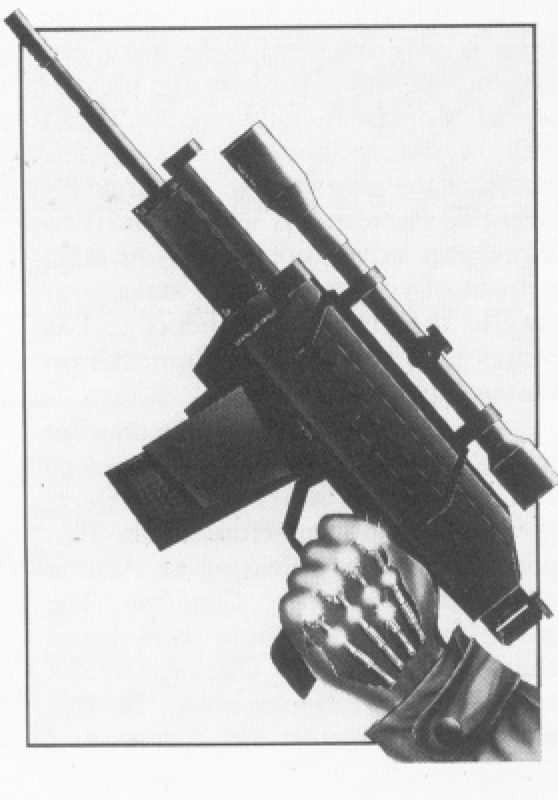
Odin bills *Mission AD* as an arcade game with a purpose.

The player's aim is to assassinate the four opponents of a military weapons system (Mission AD) and in the process he goes through 12 levels, in and out of 200 rooms and eight different areas. It's available for the C64 and costs £9.95 on cassette and £14.95 on disk.

Also from Odin is *ICUPs* – The International Commission for Universal Problem Solving. The game begins in a space tunnel, at the controls of an interstellar escort ship. In each level, progress is hindered by several varieties of space ships, torpedo bombers and pursuit ships.

It's available on cassette and disk at £8.95 and £13.95 respectively.

TOUCHLINE
Odin Graphics Limited: *01-379-6755.*



Sport for All

Martech has announced the release of *Uchi Mata*, a judo program. Brian Jacks famous for his Olympic Judo prowess assisted in the writing of the game.

Large detailed characters move, grip and hurl each other in animated sequences.

There are one or two player options, practice mode and special music and sound effects. It is £9.95 on C64 cassette and £12.95 on disk.

Sport on another planet is the subject of Hewson's lastest racing game. *Alleykat* is by *Uridium* author Andrew Braybrook and features orbiters, diamond flyers, barrow paddlers and the deadly katterkiller. Time trials, endurance epics and demolition derbies are all included. The game is £8.95 on cassette and £12.95 on disk.

Football Manager, addictive's golden oldie is back again in an updated format.

C64 and C16 versions will be available in new packaging and there is a free competition with every game. The prize is a day out at the 1987 Cup Final.

Still on the subject of football there is a new game from Scanatron, *The Double*, which again features the job of a football manager. It is designed to emulate as closely as possible the job of a real life manager. You start off as manager of a third division club and your objective is to take your squad to

DATA STATEMENTS

the first division and the FA Cup Final. The first person to achieve the coveted double wil be invited to meet Howard Kendall of Everton and will see a league fixture at Goodison Park.

TOUCHLINE
Martech: *Martech House, Bay Terrace, Pevensey Bay, E Sussex BN24 6EE. 0273-692224.*
Scanatron: *39 Totterdeon Road, Weston-Super-Mare, Avon BS23 4LH. 0934 22044.*
Hewson: *Hewson House, 56b Milton Trading Estate, Milton, Abingdon, Oxon OX14 4RX. 0235-832939.*

CRL Latest

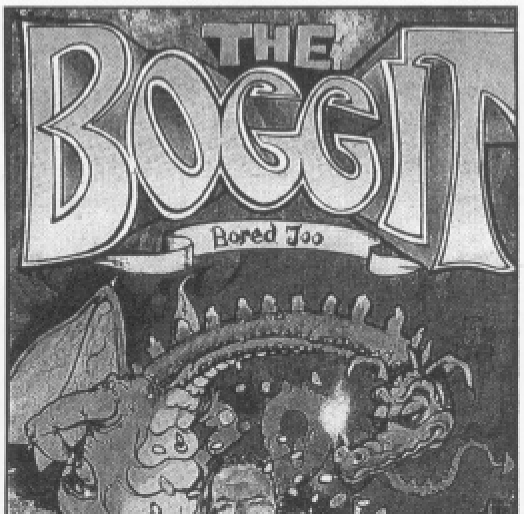
CRL is bringing out three new games for the C64 and they couldn't be more in contrast.

Bugsy (a game from the ST Brides stable) is about a gangster rabbit who turns up at the girl's school – £8.95 cassette and £12.95 disk.

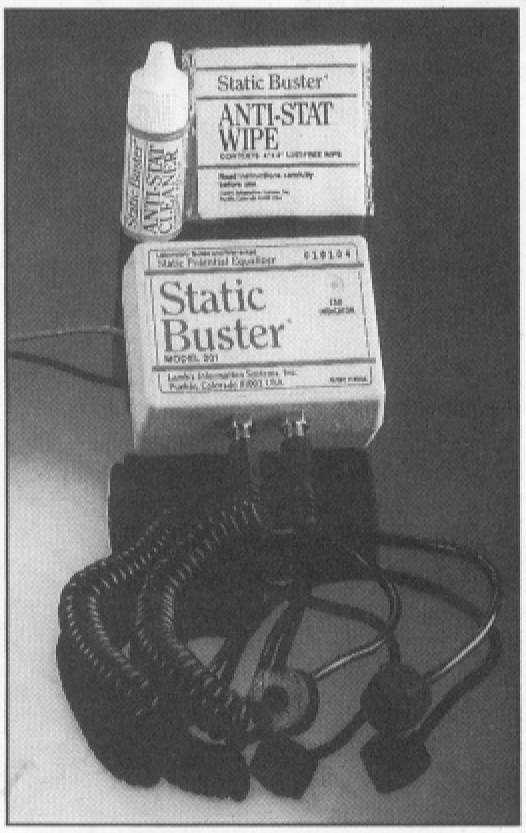
Cyborg is a space age adventure and is £8.95 cassette and £14.95 disk.

Dracula is of course an adventure about that notorious vampire and is faithfully based on Bram Stoker's novel. It is a text/graphics adventure and features authentic sounding heartbeats and dripping blood. It's £7.95 on cassette and £12.95 on disk.

TOUCHLINE
CRL: *CRL House, 9 King's Yard, Carpenter's Road, London E15 2HD. 01-985-6877.*



General Products



Integrity Solutions have decided to try and combat that not so age old problem of static effects on computers. Surveys have indicated that up to 70% of computer service calls are due to static electricity.

Integrity solutions has come up with the *Static Buster* to combat this problem. It diverts electricity from the screen, keyboard and operator. The *Static Buster* consists of a tiny unit with two leads, each with a pick up head which attaches to a screen a keyboard. A third lead attaches to an earth point with the unit acting like a static sponge and soaking up charges. The unit is priced at £49.95.

TOUCHLINE
Integrity Solutions: *504 Manchester Road, Rochdale, Lancs. OL11 3HE. 0706-345835.*

Gremlin Update

Gremlin Graphics is another company which is storming in with new releases.

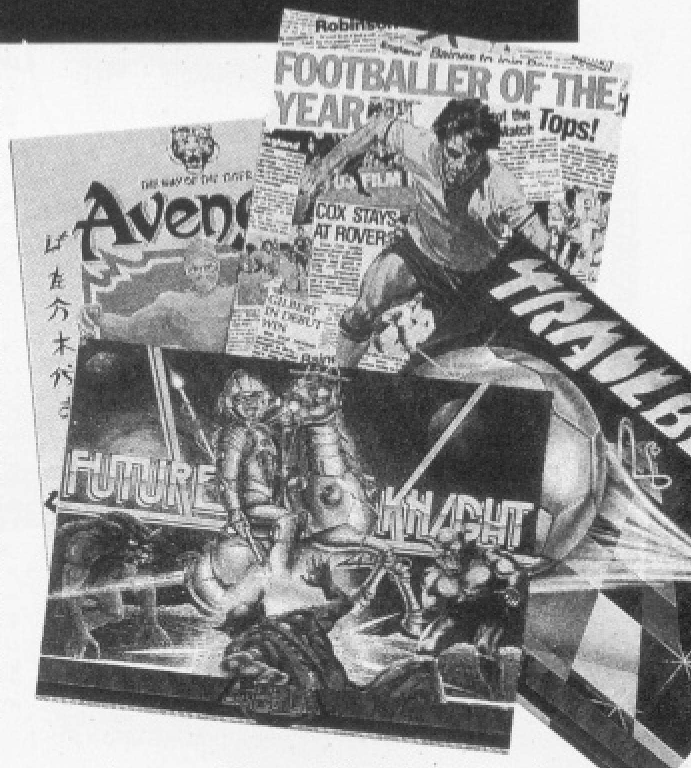
Footballer of the Year is being billed by Gremlin as a realistic football program.

You adopt the role of a professional footballer and at 17 you start your career in the fourth division. You have £500 in cash and 10 goal cards and your ambition is to be nominated footballer of the year. The game will be available on both the C16 and C64.

Gremlin is also bringing out compilation tapes of past hits which will comprise of two tapes packaged together containing two games each. The compilation will cost £9.95 and the C16 is a favoured machine for this release.

For the C64 there will be *Future Knight* featuring Randolph, a hero who must rescue a beautiful maiden from the dreaded clutches of Spegbott the terrible. Princess Amanda is a prisoner aboard the derelict space ship Rustbucket and there are 20 levels of Berzerka security droids to negotiate before you can be reunited with her.

Trailblazer on the C64 is a space age racing game featuring an oversized football on an interstellar race track. Speed of reactions are the essence in this game.



Avenger (Way of the Tiger 2) is the first arcade/adventure in the *Way of the Tiger* series. In this game you are a Ninja warrior and have to avenge the death of your foster father Naijishi who was killed by Naemon. You will need all your skills when you enter the great keep to avenge Naijishi's death and recover the Scrolls of Kettsuin.

TOUCHLINE
Gremlin Graphics: *Alpha House, 10 Carver Street, Sheffield S1 4FS. 0742-753423.*

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GAME OF THE MONTH

Trailblazer

Ever fancied yourself as a football travelling along an interstellar bypass? You Have? Gremlin's latest masterpiece can help you realise your strange ambition.

By Stuart Cooke

If, like most people, you think that driving around a major city such as London in the rush hour is a little hair-raising then the latest release from Gremlin Graphics will have you thinking again.

It's not so much the fact that there are thousands of cars trying to reach the same destination (in fact there are only you and one opponent), it's the fact that the quality of the road is so poor. You could say it is fairly reminiscent of a Sunday drive around the M25.

Before I pass any further comments on the game I think a little scene setting is in order.

Imagine this. You are a football, yes I know that is hard to imagine but do try, travelling down an interstellar bypass. OK, so it is a little hard to imagine but I'm sure the bypass is interstellar since there seems to be no ground beneath it and all around are millions of stars.



The C64's screen is split into two sections. The top half of the screen being one player's view of his ball and the track ahead of it, the bottom half being the second player's view. As the game starts you soon realise that the road, bypass, course, call it what you will, is not all that it seems. As you watch the other player disappear off into the distance and you phut-phut along more like a Morris-Minor than a football in outer space, certain things about the track become apparent. It is made up of multi-coloured squares.

So what do the squares do? Firstly I watched with horror as my poor little football disappeared into the void through a black hole. Thankfully it did return after a few moments, though a number of valuable seconds were wasted. Secondly, my ball, which was by now travelling at umpteen million miles per hour, was flung backward at an alarming rate of knots as it hit a purple square.

This is when I decided to find out what each of the squares do. I have already gone over the effects of the black and purple squares. The blue ones simply cause your ball to bounce, useful when your road suddenly disappears ahead of you. Red ones slow you down and green ones speed you up. If you are lucky (?) enough to hit a white square then your ball shoots off down the track with a turbo boost, well at least until you fall down a hole which is bound to happen sooner or later. As for the pretty cyan ones, well I'll leave that for you to find out, though I must say they are extremely confusing.

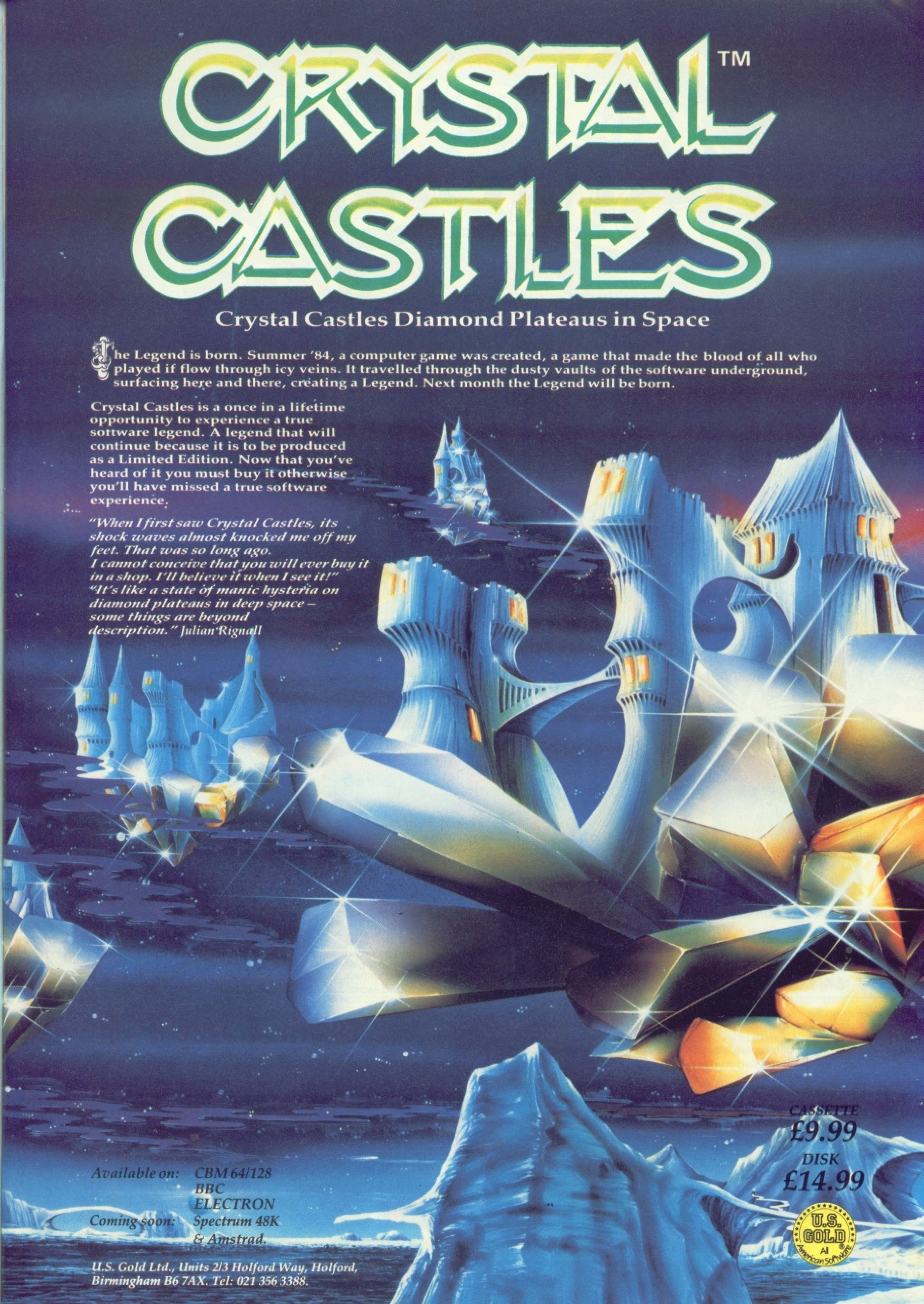
Numerous playing options are included in the game. You can have a one or two player arcade game, where you must complete the course in a limited time. You are also only given seven jumps which makes it even trickier. A one or two player trial game allows you to get used to the handleing of your ball down a series of practice tracks and the final option allows you to race against a robot, which is not that easy to beat.

Controlling the game is extremely easy. Forward and Back to speed up and slow down. Left and Right to move across the track and fire to force your ball to jump. Getting your ball to land where you want is the major problem.

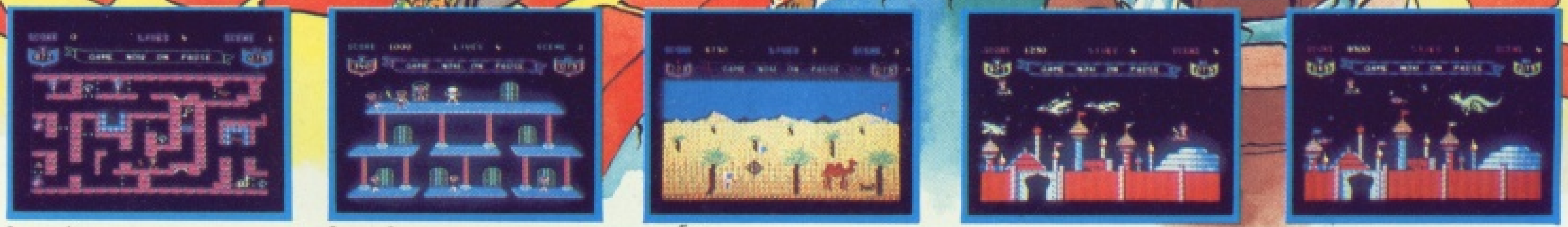
The graphics and sound are limited though adequate for the game. The scrolling playing area is detailed enough to let you see the obstacles in front of you as you career down the track, though I must admit, at top speed, by the time you realise a hole is coming up, you have generally fallen through it.

On second thoughts a Sunday drive around the M25 is a picnic compared to this game. Full speed ahead to your local computer shop and buy a copy. Mind you watch your TV screen, after a few hours playing this game you'll be just about ready to put your joystick through it. YC

Touchline
Name: ***Trailblazer.*** *Price:* ***£9.95.*** *Machine:* ***C64.*** *Supplier:* ***Gremlin Graphics, Alpha House, 10 Carver Street, Sheffield S1 4FS.*** *Tel:* ***(0742) 753423.***
Originality: ***10/10.*** *Graphics:* ***9/10.*** *Playability:* ***10/10.*** *Value:* ***10/10.***


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Scene 1 — Escape from the dungeon

Scene 2 — Battle with the guards

Scene 3 — Protect your camels on the desert crossing

Scene 4 — Flying carpets and giant Roc birds

Scene 5 — The sultan transforms himself into a dragon

THE LEGEND OF SINBAD for the Commodore 64/128

Game Author: Jason Benham.

COMMODORE 64/128

Set in the golden age of Caliph Al-Rashid, you play the role of the brave adventurer Sinbad the Sailor. You have been kidnapped and thrown into the dungeon of Sultan Salabim's fortress. But, retrieving your plundered treasure, you escape from the dungeon by battling your way past the guards and vultures through the serpent-infested tunnels.

Once past the two dungeon gates, you stumble across a discarded sword. Just in time, because a second troop of fortress guards appear and a terrifying battle ensues.

Conquering the guards, you now head for home transporting your valuables on a caravan of camels across the scorching desert to Baghdad. Bravely, you defend the camels against the incessant attacks of the deadly beasts of the sand.

The Sultan Salabim, furious at your escape, orders his personal bodyguards aboard flying carpets and summons the giant Roc birds. Together, they form a cordon around Baghdad. Undaunted, you take to the skies, and the scene is set for a dramatic showdown high above the towers of the city.

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Write On

Eric Doyle looks at the Script/Plus cartridge which could vastly improve your wordpro powers.

A wordprocessor for the Plus/4 may seem like a strange concept when there's already one in there and the C-16 must surely be too small. Why then is Parasoft trying to market the *Script/Plus* cartridge?

The short answer is that this package has to be seen to be believed. In one small cartridge is packed the very popular Easyscript wordpro with whistles and bells attached. It beats the on-board software in the Plus/4 hands down and turns the C-16 into a very useful writing implement.

All the major functions of a wordpro are here. Block move and erase, text search and replace, variable margins, final printout preview and disk/cassette options are just some of the standard options. Added to this is the ability to use mail merge techniques to create individualised standard letters, a simple calculator and non-Commodore printer commands.

Once the cartridge is plugged in, it is called up by pressing the F2 key and RETURN. After choosing your options for save/load devices, screen display size and printer type, the screen changes to show a reversed command line at the top with 24 lines for text. As the text is entered the screen scrolls to the right if your selected width is greater than 40 and upwards as you fill all of the lines available in memory. On the Plus/4 you have 501 lines of text in 40 column mode or 83 lines in 240 mode. On the C-16 this reduces to 91 lines or 15 lines respectively. Obviously the restriction on the C-16 limits its uses to letter writing unless you use several linked files to build up a more substantial document.

Formatting commands are embedded into the text and are denoted by a reversed asterisk. A very useful addition to the normal margin and page length settings is the ability to place fixed headers and footers on each page automatically. As the names suggest headers are at the top of each page and footers at the bottom. At their simplest these might be automatically increased page numbers placed at the left, centre or right of the line. Where a more professional finish is required it is possible to have a document name, chapter heading and page number displayed at the top of xxx

page number displayed at the top or bottom (or both) of each page as it is printed out.

To select a special option such as load, save or search and replace, the ESCape key is used to switch from text mode to command mode and then a letter key will place you in the correct mode with a suitable phrase displayed on the command line to confirm your choice. The key to be pressed is usually the first letter of the required command. To save you having to search the house for your manual every time you need to access a little used special function, the F7 key will bring up a series of HELP screens which summerise all of the commands.

All of the function keys have predefined functions which can save a lot of messing about when you want to access commonly used commands such as load, save or to display the text on the screen in the way it will appear on the printer. Unfortunately the keys cannot be redefined to suit your own requirements.

Disk users can revel in a superb disk support system. All of the usual functions such as scratch and rename are accessible but use the old DOS formats which are detailed in the substantial manual which accompanies the cartridge. As well as the disk command which allows you to call up the directory at any time, a variant of this is included which lists all of the Script/Plus files on a disk and then allows you to select the one which you want to load.

Incidentally, the C-16 *Script/Plus* file would have reached capacity during the last paragraph.

By far the most powerful facility is the ability to create a series of linked files. Often a document will not fit into the available memory, especially on the C-16. When this occurs it is possible to set a command at the end of the first section to say that there is going to be a second file. The first file is saved and the memory cleared for the entry of the second part of the document. This may be repeated from file to file until full document is on disk in as many parts as necessary. When printing out you tell the computer to expect a string of linked files and each will be loaded and printed in turn.

Another benefit is when you discover that a word needs changing in a completed document. This word may occur in several of the linked files but presents no problem to the program. Using the search and replace function, the computer will start at the first file and work its way through all of the linked files changing the word according to your needs.

In the space of a review I can only nibble away at this tasty model. The manual contains over 150 pages detailing all of the functions available. If you frequently use the wordprocessor in your Plus/4 or if you own a C-16 and need a wordprocess then save up your pennies for this package. *Script/Plus* is not only the most powerful wordprocessor for the C-16/Plus/4 but also ranks highly in comparison to wordprocessors on any other computer.

As a guide to the space available in the Plus/4, I've reached the end of the document and my command line tells me I've used just under 150 lines of my allotted 501. YC

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Into the Eighties

Are you fed up of enduring your C64's 40 column screen? This program should bring you into the Eighties in a flash

By S.J. Chance

A few weeks ago an actress-friend of mine came round to borrow my typewriter. She wanted to produce a page of quotes from her recent 'rave reviews' to send to prospective employers. Several screwed-up sheet s of A4 later, I went out for an emergency supply of correction fluid.

This still didn't make the going less heavy, so I volunteered to 'word-process' it on my 64. She (my actress friend that is; my 64 has yet to deserve that particular pronoun), wanted the reviews presented in a newspaper format, with different sized columns and blocks all over the place. Trying to do this to 70 columns width on a 40 column screen was rather more complicated than I had anticipated, the text rapidly forming a literacy-defying tangle of bits of different sentences. In the end we gave up. My actress has not been to see me since.

"Oh, for an 80 column display mode!" I thought. "Perhaps I can write a sub-routine that will create one."

I started with a simple routine for plotting user-defined characters on to the hi-res screen. It was then necessary to reproduce all the cursor routines of the normal text screen, but manipulating eight times as much date. This was further complicated by the structure of the screen itself. The hi-res screen consists of 'character positions' of eight bytes, forming forty 8 × 8 grids across the screen. To achieve 80 character positions, each 8 × 8 grid would have to contain two characters. This demanded much ANDing, ORing, ROLing and RORing.

Once you have successfully RUN the loader program, the subroutine can be initialised by SYS 49789. You should now find yourself looking at the 80 column screen, blank except for the 'READY' prompt, written in teeny-weeny-letters in the top left hand corner.

If you now type 'LIST', the first thing you will notice is that the word does not appear on the 80 column screen. However, when RETURN is pressed, the program lists in the usual way. This is where you will discover the limitations of the resolution of the T.V. or monitor you are using. Having only a humble black and white portable, I find the text quite readable. If you ae using a colour television, it may help if you de-tune the channel you are using to black and white.

The F8 key will toggle back to the normal text screen, where you may like to enter these lines of Basic:

```
10 GET A$ : IF A$="" GOTO 10
20 PRINT A$; :GOTO 10
```

If you RUN this, any characters you enter will now be output to both the 40 and 80 column screens. This includes changes in colour, but with the limitation that each nybble of foreground colour has to serve two characters. For this reason, INSERT and DELETE do not scroll the colour memory as they do on the normal text screen.

The character-set was originally more curvatious, but I found that squaring-up the corners and avoiding diagonal lines produced a far bolder image. As 80COL is intended for word-processing, most graphics characters would be redundant; thus when they are encountered, the default character of a reverse-space is printed. If you wish to experiment with the character-set, the relevant DATA begins with the four double-zero's in line 575.

The program occupies memory from $C27D to $CBFF. Colour memory starts at $CC00, and the hi-res screen uses the RAM behind the KERNAL ROM at $E000. The subroutine is wedged into the operating system via the CHROUT vector at $0326.

Perhaps next time one of your friends needs a favour, you'll fare rather better than I did! YC

PROGRAM: 80 COLUMN

Please read 'LISTINGS' before entering program.

```
36  5 A=49789:B=100
5B  10 FORZ=0TO110:C=0:FORY=0TO21
7B  15 READD$:HB$=LEFT$(D$,1):LB$=RIGHT$(D$,1)
7C  20 HB=VAL(HB$):IFASC(HB$)>57THENHB=ASC(HB$)-55
07  25 LB=VAL(LB$):IFASC(LB$)>57THENLB=ASC(LB$)-55
54  30 D=HB*16+LB:C=C+D:POKEA,D:A=A+1:NEXT
7B  35 READCHECK:IFCHECK<>CTHENGOSUB45
84  40 PRINTB:B=B+5:NEXT:END
ED  45 PRINT"ERROR IN LINE"B:RETURN
5B  100 DATA 78,20,3E,C4,20,E6,C3,20,0A,C4,A9,00,8D,C0,02,A9,A5,8D,14,03,A9,C2,2470
0E  105 DATA 8D,15,03,A9,EB,8D,26,03,A9,C5,8D,27,03,20,98,C3,58,60,AD,C0,02,F0,2470
25  110 DATA 03,4C,29,C3,CE,B8,02,F0,4F,A9,32,CD,B8,02,F0,03,4C,29,C3,A9,01,8D,2502
29  115 DATA BA,02,A5,FB,8D,BC,02,A5,FC,8D,BD,02,AD,A7,02,8D,BE,02,85,FB,AD,A8,3084
46  120 DATA 02,8D,BF,02,85,FC,20,D6,C3,A0,07,B1,FB,99,C1,02,AE,AB,02,D0,05,09,2674
D1  125 DATA F0,4C,F1,C2,09,0F,91,FB,88,10,EA,20,DE,C3,A9,14,8D,B8,02,4C,1F,C3,2824
0D  130 DATA A9,00,8D,BA,02,AD,BE,02,85,FB,AD,BF,02,85,FC,A0,07,B9,C1,02,91,FB,2941
F7  135 DATA 88,10,F8,A9,46,8D,B8,02,AD,BC,02,85,FB,AD,BD,02,85,FC,20,EA,FF,A5,3148
BB  140 DATA CC,D0,29,C6,CD,D0,25,A9,14,85,CD,A4,D3,46,CF,AE,87,02,B1,D1,B0,11,3170
91  145 DATA E6,CF,85,CE,20,24,EA,B1,F3,8D,87,02,AE,86,02,A5,CE,49,80,20,1C,EA,2952
86  150 DATA A5,01,29,10,F0,0A,A0,00,84,C0,A5,01,09,20,D0,08,A5,C0,D0,06,A5,01.2117
70  155 DATA 29,1F,85,01,20,87,EA,CA,BD,77,02,C9,8C,D0,17,C6,C6,AD,11,D0,29,20,2558
6D  160 DATA D0,06,20,98,C3,4C,95,C3,20,B6,C3,A9,0E,20,CA,F1,4C,7E,EA,AD,02,DD,2912
40  165 DATA 09,03,8D,02,DD,AD,11,D0,09,20,8D,11,D0,AD,00,DD,29,FC,8D,00,DD,A9,2399
EC  170 DATA 38,8D,18,D0,60,AD,02,DD,09,03,8D,02,DD,AD,11,D0,29,DF,8D,11,D0,AD,2498
E7  175 DATA 00,DD,29,FC,09,03,8D,00,DD,A9,15,8D,18,D0,60,78,A5,01,29,FD,85,01,2261
83  180 DATA 60,A5,01,09,02,85,01,58,60,A9,00,85,FB,A9,E0,85,FC,A0,00,A9,00,91,2396
4D  185 DATA FB,A5,FB,C9,3F,D0,07,A5,FC,C9,FF,D0,01,60,E6,FB,D0,02,E6,FC,4C,F0,3813
12  190 DATA C3,A9,00,85,FB,A9,CC,85,FC,A0,00,AD,21,D0,29,0F,85,FD,AD,86,02,0A,2841
9C  195 DATA 0A,0A,0A,29,F0,05,FD,91,FB,A6,FB,E0,E8,D0,07,A6,FC,E0,CF,D0,01,60,3207
5E  200 DATA E6,FB,D0,02,E6,FC,4C,26,C4,A9,00,8D,A7,02,A9,E0,8D,A8,02,A9,00,8D,2976
5F  205 DATA A9,02,A9,CC,8D,AA,02,A9,00,8D,AB,02,60,A9,00,8D,AD,02,20,D6,C3,A9,2531
39  210 DATA 7B,85,FB,A9,CA,85,FC,18,0E,AC,02,2E,AD,02,18,0E,AC,02,2E,AD,02,18,2153
B4  215 DATA AD,AC,02,65,FB,85,FB,AD,AD,02,65,FC,85,FC,AD,A7,02,85,FD,AD,A8,02,3240
7E  220 DATA 85,FE,AD,AB,02,D0,44,A0,00,A2,04,B1,FD,29,0F,8D,AC,02,B1,FB,29,F0,2845
93  225 DATA 0D,AC,02,91,FD,E6,FD,D0,02,E6,FE,B1,FD,29,0F,8D,AC,02,B1,FB,0A,0A,3011
61  230 DATA 0A,0A,0D,AC,02,91,FD,E6,FD,D0,02,E6,FE,E6,FB,D0,02,E6,FC,CA,D0,C9,3566
24  235 DATA EE,AB,02,20,DE,C3,4C,23,C5,A0,00,A2,04,B1,FD,29,F0,8D,AC,02,B1,FB,2948
F3  240 DATA 4A,4A,4A,4A,0D,AC,02,91,FD,E6,FD,D0,02,E6,FE,B1,FD,29,F0,8D,AC,02,3084
18  245 DATA B1,FB,29,0F,0D,AC,02,91,FD,E6,FD,D0,02,E6,FE,E6,FB,D0,02,E6,FC,CA,3621
EC  250 DATA D0,C9,A5,FD,8D,A7,02,A5,FE,8D,A8,02,CE,AB,02,20,DE,C3,AD,A9,02,85,3172
D6  255 DATA FB,AD,AA,02,85,FC,A0,00,AD,86,02,0A,0A,0A,0A,8D,AC,02,B1,FB,29,0F,2289
23  260 DATA 0D,AC,02,91,FB,AD,AB,02,D0,08,EE,A9,02,D0,03,EE,AA,02,60,A9,00,85,2573
56  265 DATA FB,18,69,40,85,FD,A9,E0,85,FC,69,01,85,FE,20,D6,C3,A0,00,B1,FD,91,3277
DA  270 DATA FB,A5,FD,C9,3F,D0,06,A5,FE,C9,FF,F0,0F,E6,FB,D0,02,E6,FC,E6,FD,D0,4141
AA  275 DATA 02,E6,FE,4C,66,C5,20,DE,C3,A9,00,E6,FB,D0,02,E6,FC,91,FB,A6,FB,E0,3689
12  280 DATA 3F,D0,06,A6,FC,E0,FF,F0,03,4C,8A,C5,A9,00,85,FB,18,69,28,85,FD,A9,3105
22  285 DATA CC,85,FC,69,00,85,FE,B1,FD,91,FB,A5,FD,C9,E8,D0,06,A5,FE,C9,CF,F0,4039
B6  290 DATA 0F,E6,FB,D0,02,E6,FC,E6,FD,D0,02,E6,FE,4C,B2,C5,A9,00,8D,A7,02,A9,3464
66  295 DATA FE,8D,A8,02,A9,C0,8D,A9,02,A9,CF,8D,AA,02,A9,00,8D,AB,02,60,8D,AC,2819
BA  300 DATA 02,48,8A,48,98,48,A5,9A,C9,03,F0,08,68,A8,68,AA,68,4C,CA,F1,A9,01,2618
30  305 DATA 8D,C0,02,AD,BA,02,F0,1E,A9,00,8D,BA,02,AD,BE,02,85,FB,AD,BF,02,85,2712
D8  310 DATA FC,A0,07,B9,C1,02,91,FB,88,10,F8,A9,33,8D,B8,02,AD,AC,02,C9,FF,D0,3153
55  315 DATA 08,A9,7E,8D,AC,02,4C,4F,C6,C9,E0,90,09,38,E9,40,8D,AC,02,4C,4F,C6,2570
2F  320 DATA C9,C0,90,06,38,E9,60,8D,AC,02,C9,0D,D0,06,20,F6,C9,4C,EE,C9,C9,11,2883
D7  325 DATA D0,75,AD,A8,02,C9,FE,90,49,AD,A7,02,C9,00,90,42,AD,AB,02,8D,B2,02,2760
01  330 DATA AD,A7,02,8D,AE,02,AD,A8,02,8D,AF,02,AD,A9,02,8D,B0,02,AD,AA,02,8D,2469
C5  335 DATA B1,02,20,50,C5,AD,B2,02,8D,AB,02,AD,AE,02,8D,A7,02,AD,AF,02,8D,A8,2473
BC  340 DATA 02,AD,B0,02,8D,A9,02,AD,B1,02,8D,AA,02,4C,CF,C6,18,AD,A7,02,69,40,2346
71  345 DATA 8D,A7,02,AD,A8,02,69,01,8D,A8,02,18,AD,A9,02,69,28,8D,A9,02,AD,AA,2238
AD  350 DATA 02,69,00,8D,AA,02,4C,EE,C9,C9,13,D0,06,20,3E,C4,4C,EE,C9,C9,14,F0,2635
0F  355 DATA 03,4C,F8,C7,AD,A7,02,8D,B0,02,AD,A8,02,8D,B1,02,AD,A9,02,8D,B2,02,2515
2C  360 DATA AD,AA,02,8D,B3,02,20,F6,C9,AD,B0,02,8D,A7,02,AD,B1,02,8D,A8,02,AD,2643
67  365 DATA B2,02,8D,A9,02,AD,B3,02,8D,AA,02,A2,08,A0,00,20,D6,C3,AD,AB,02,D0,2484
7E  370 DATA 4D,AD,A7,02,C9,00,D0,0D,AD,A8,02,C9,E0,D0,06,20,DE,C3,4C,EE,C9,38,2843
1B  375 DATA AD,A9,02,E9,01,8D,A9,02,AD,AA,02,E9,00,8D,AA,02,38,AD,B0,02,E9,08,2429
F5  380 DATA 8D,B0,02,8D,A7,02,AD,B1,02,E9,00,8D,B1,02,8D,A8,02,AD,B0,02,85,FD,2582
D1  385 DATA AD,B1,02,85,FE,B1,FD,29,F0,8D,B6,02,AD,AE,02,85,FB,AD,AF,02,85,FC,3243
78  390 DATA 8C,AC,02,38,A5,FB,E9,08,85,FB,A5,FC,E9,00,85,FC,B1,FB,18,2E,AC,02,3118
E6  395 DATA 2A,2E,AC,02,2A,2E,AC,02,2A,2E,AC,02,2A,2E,AC,02,91,FB,2E,AC,02,2E,1710
05  400 DATA AC,02,2E,AC,02,2E,AC,02,A5,FB,CD,B0,02,D0,C8,A5,FC,CD,B1,02,D0,C1,3023
18  405 DATA AD,AB,02,D0,09,B1,FD,29,0F,0D,B6,02,91,FD,EE,AE,02,D0,03,EE,AF,02,2684
A2  410 DATA EE,B0,02,D0,03,EE,B1,02,CA,F0,0B,AD,AB,02,F0,03,4C,6F,C7,4C,5E,C7,2841
F7  415 DATA 20,DE,C3,CE,AB,02,F0,06,EE,AB,02,EE,AB,02,4C,EE,C9,C9,1D,D0,3B,AD,3081
A6  420 DATA AB,02,D0,06,EE,AB,02,4C,EE,C9,CE,AB,02,18,AD,A7,02,69,08,8D,A7,02,2481
61  425 DATA AD,A8,02,69,00,8D,A8,02,EE,A9,02,D0,03,EE,AA,02,AD,A7,02,C9,40,D0,2604
92  430 DATA 0A,AD,A8,02,C9,FF,D0,03,20,50,C5,4C,EE,C9,C9,8D,D0,06,20,F6,C9,4C,2955
84  435 DATA EE,C9,C9,91,D0,35,A2,E1,EC,A8,02,90,09,D0,29,AE,A7,02,E0,40,90,22,3050
ED  440 DATA 38,AD,A7,02,E9,40,8D,A7,02,AD,A8,02,E9,01,8D,A8,02,38,AD,A9,02,E9,2526
F9  445 DATA 28,8D,A9,02,AD,AA,02,E9,00,8D,AA,02,4C,EE,C9,C9,93,D0,0C,20,E6,C3,2783
1A  450 DATA 20,0A,C4,20,3E,C4,4C,EE,C9,C9,94,F0,03,4C,72,C9,AD,A7,02,8D,B0,02,2687
2D  455 DATA AD,A8,02,8D,B1,02,A
```

```
     D,A9,02,8D,B2,02,AD,AA,02,8D
     ,B3,02,20,F6,C9,AD,2647
FB   460 DATA B0,02,8D,A7,02,AD,B
     1,02,8D,A8,02,AD,B2,02,8D,A9
     ,02,AD,B3,02,8D,AA,2481
17   465 DATA 02,AD,A7,02,85,FB,A
     D,A8,02,85,FC,A0,00,8C,AC,02
     ,A2,08,20,D6,C3,AD,2714
2E   470 DATA AB,02,F0,09,B1,FB,8
     D,B6,02,29,0F,91,FB,B1,FB,18
     ,6E,AC,02,6A,6E,AC,2751
F4   475 DATA 02,6A,6E,AC,02,6A,6
     E,AC,02,6A,6E,AC,02,91,FB,6E
     ,AC,02,6E,AC,02,6E,2246
B6   480 DATA AC,02,6E,AC,02,18,A
     5,FB,69,08,85,FB,A5,FC,69,00
     ,85,FC,A5,FB,CD,AE,3097
73   485 DATA 02,D0,C8,A5,FC,CD,A
     F,02,D0,C1,AD,AB,02,F0,11,AD
     ,B0,02,85,FB,AD,B1,3298
66   490 DATA 02,85,FC,AD,B6,02,2
     9,F0,91,FB,EE,B0,02,D0,03,EE
     ,B1,02,AD,B0,02,85,2949
1E   495 DATA FB,AD,B1,02,85,FC,E
     E,AE,02,D0,03,EE,AF,02,8C,AC
     ,02,AD,AB,02,F0,09,2937
2B   500 DATA B1,FB,8D,B6,02,29,0
     F,91,FB,CA,F0,03,4C,E6,C8,20
     ,DE,C3,4C,EE,C9,C9,3321
4B   505 DATA 9D,D0,44,AD,AB,02,F
     0,06,CE,AB,02,4C,EE,C9,AD,A7
     ,02,C9,00,D0,0A,AD,2853
CD   510 DATA A8,02,C9,E0,D0,03,4
     C,EE,C9,EE,AB,02,38,AD,A7,02
     ,E9,08,8D,A7,02,AD,2854
33   515 DATA A8,02,E9,00,8D,A8,0
     2,38,AD,A9,02,E9,01,8D,A9,02
     ,AD,AA,02,E9,00,8D,2379
19   520 DATA AA,02,4C,EE,C9,C9,A
     0,D0,05,A9,20,8D,AC,02,C9,A1
     ,90,05,A9,80,8D,AC,2898
2F   525 DATA 02,C9,20,90,1E,C9,8
     1,B0,1A,38,E9,20,8D,AC,02,20
     ,58,C4,AD,A7,02,C9,2436
77   530 DATA 40,D0,0A,AD,A8,02,C
     9,FF,D0,03,20,50,C5,A9,00,8D
     ,C0,02,4C,F9,C5,A9,2796
5A   535 DATA 00,8D,AE,02,A9,E0,8
     D,AF,02,A2,00,AD,AF,02,CD,A8
     ,02,90,0C,D0,1F,AD,2483
D0   540 DATA AE,02,CD,A7,02,F0,0
     2,B0,15,18,AD,AE,02,69,40,8D
     ,AE,02,AD,AF,02,69,2303
DF   545 DATA 01,8D,AF,02,E8,4C,0
     2,CA,AD,AC,02,C9,94,F0,48,C9
     ,14,F0,44,AD,AE,02,2717
2C   550 DATA 8D,A7,02,AD,AF,02,8
     D,A8,02,A9,00,8D,AB,02,A9,00
     ,8D,A9,02,A9,CC,8D,2449
3A   555 DATA AA,02,E8,CA,F0,14,1
     8,AD,A9,02,69,28,8D,A9,02,AD
     ,AA,02,69,00,8D,AA,2452
A4   560 DATA 02,4C,52,CA,AD,A7,0
     2,C9,40,90,0A,AD,A8,02,C9,FF
     ,D0,03,20,50,C5,60,2538
EB   565 DATA 00,00,00,00,66,66,0
     6,60,55,00,00,00,55,F5,5F,55
     ,27,AA,73,E2,EA,F2,1927
06   570 DATA 4F,57,04,A4,A9,70,2
     4,00,00,00,12,44,44,21,42,11
     ,11,24,00,96,F6,90,1514
5C   575 DATA 02,27,22,00,00,00,0
     3,34,00,07,00,00,00,00,06,60
     ,11,22,44,88,69,BD,788
5F   580 DATA 99,60,26,22,22,70,6
     9,12,48,F0,71,27,12,40,13,79
     ,F1,10,74,47,11,60,1833
9D   585 DATA 12,4E,99,60,F1,22,4
     4,40,69,96,99,60,69,97,12,40
     ,06,60,06,60,06,60,1900
E8   590 DATA 06,64,12,48,42,10,0
     0,70,70,00,84,21,24,80,25,12
     ,20,20,69,BB,88,70,1490
F5   595 DATA 00,71,75,70,44,75,5
     5,70,00,74,44,70,11,75,55,70
     ,00,75,74,70,03,44,1767
E3   600 DATA 64,40,00,75,57,17,4
     4,75,55,50,20,22,22,20,20,22
     ,22,24,45,56,65,50,1345
F7   605 DATA 44,44,44,60,00,9F,9
     9,90,00,75,55,50,00,75,55,70
     ,00,75,57,44,00,75,1741
32   610 DATA 57,11,00,74,44,40,0
     0,74,71,70,44,74,44,70,00,55
     ,55,70,00,55,55,20,1541
53   615 DATA 00,99,9F,90,00,55,2
     5,50,00,55,57,17,00,71,24,70
     ,76,66,66,70,25,4F,1664
B1   620 DATA 44,F0,73,33,33,70,0
     2,72,22,22,00,4F,40,00,00,0F
     ,F0,00,25,57,55,50,1508
A3   625 DATA 65,57,55,60,75,44,4
     5,70,65,55,55,60,74,47,44,70
     ,74,47,44,40,75,47,1976
25   630 DATA 55,70,55,57,55,50,7
     2,22,22,70,72,22,2A,E0,55,56
     ,65,50,44,44,44,70,1910
F0   635 DATA 9F,99,99,90,9D,DF,B
     B,90,75,55,55,70,75,57,44,40
     ,75,55,55,23,75,57,2581
39   640 DATA 65,50,74,47,11,70,7
     2,22,22,20,55,55,55,70,55,55
     ,55,20,99,99,9F,90,1974
56   645 DATA 55,52,25,50,55,55,2
     2,20,71,12,44,70,66,6F,F6,66
     ,A5,A5,A5,A5,66,66,2256
5D   650 DATA 66,66,00,FA,AA,A0,F
     F,77,33,11,FF,FF,FF,FF,00,00
     ,00,00,00,00,00,00,2246
```

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Super Diskdoc

Whatever your machine or disk drive, this utility from Precision will certainly help sort out any disk problems.

By Stuart Cooke

All disk drive owners at some time or another will have tried to LOAD a program from disk only to find that the computer/disk drive arrangement is not happy at all and simply doesn't want to look at the file. This sort of problem is generally due to the program becoming corrupted on the disk. This and many other problems can be overcome with *Super Diskdoc* from Precision Software.

One excellent feature of this program is that it will work with just about any Commodore computer. It recognises the machine you are using and adjusts itself upon loading to suit the environment in which you are working. For example, if you are using a C128 in 80 column mode the display presented to you will be in 80 columns. If you are using a Plus/4 then the display is presented in 40 column format.

The actual display consists of a number of menu and status lines at the top of the screen together with a display of the data that is currently held in the buffer. Data is displayed in both ASCII and hexadecimal formats.

If you have ever come across Precision's superb *Superscript 64* then you will be used to the type of menus presented. For the uninitiated, the menus consist of a number of words at the top of the screen. Choosing the required option is simply a matter of highlighting the correct option and selecting it. If this command has further options stored 'beneath' it, then these are shown and you can choose from these as required. This makes the program extremely user friendly, as you never have to remember any of the commands yourself, simply follow through the menus until the command you are looking for appears. One very handy feature is the help message that explains briefly what each command does that appears on the line below the menu whenever you select an option.

Documentation

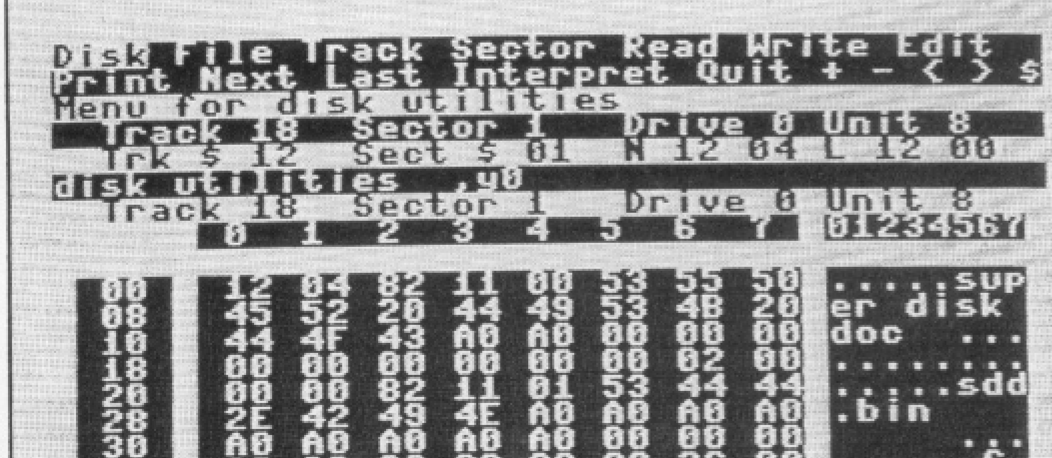
The documentation supplied with the program is best described as sparse but adequate. A small tutorial takes you through simple operations such as examining a file that is stored on disk and how to alter a disk directory. I can't help thinking that a more detailed description on the exact format of the data stored on a disk and what it all means would have been very helpful, to beginners especially but also to hardened programmers as a sort of reference guide. To be fair the 'tutorials' do give a little bit of the information required and should be enough to get most people started.

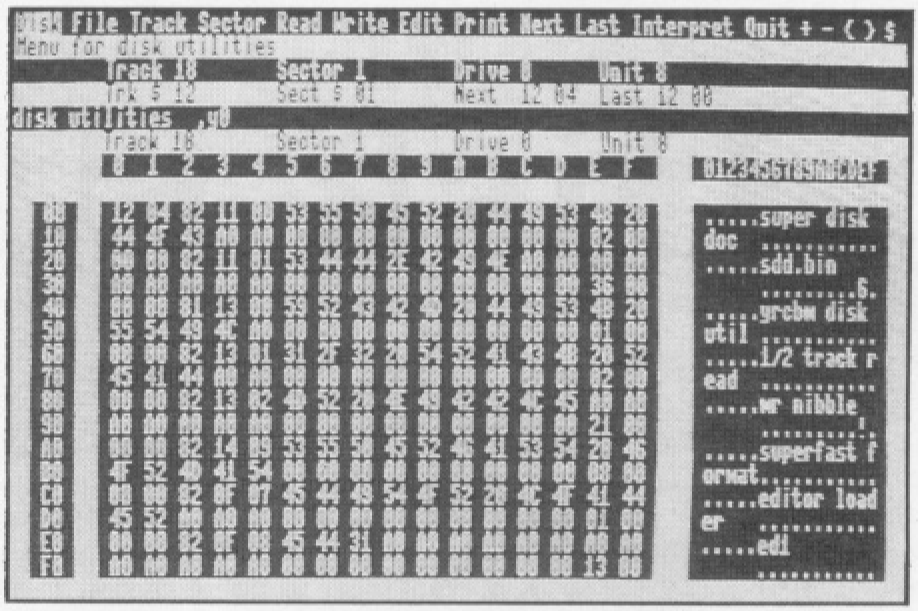
The manual goes into quite a lot of detail about how to recover damaged files on your disk, cutting out any corrupted data. Having had to resort to this drastic action on numerous occasions, this facility is a life saver. An explanation is also given on how to overcome a Data Checksum error, or the dreaded error 23. This means that the data has been read from disk but upon its second reading the two bits of data don't match. With *Super Diskdoc* you can now recover even this data.

Menu Options

The best way to explain the capabilities of such a program is to actually work through the main menu command by command.

The first command available is 'DISK'. This is the menu for disk utilities. Upon selecting this a sub menu appears offering you the options of:





Drive – which allows you to change the drive you are working on.l
Unit – this lets you change the device that you are working on (8,9 etc.).
Report – this checks a whole disk for errors, output is to either screen or printer.
Change – to tell *Diskdoc* that you are removing the disk.
LOG – displays a directory of the disk giving the size of the file, the track and sector of the first block of the file. If the file is a PRG file then the start address is given. In fact all of the information that you would ever require.
Hunt – searches the disk for the occurrence of a string of characters.
Memory – allows you to examine and change data held in the disk drives internal memory.
Sort – allows you to alter the order of the files on a disk.
GO – reads into the buffer either the first sector of the disk directory, the BAM or the header.
Init – allows you to select whether the disk is initialised before the first operation.
Name – allows you to change the disk name.
Validate – tidies up your disk directory as the normal disk 'V' command.

One command has been omitted from the above list. This is the BAM command. Upon selection of this a further menu is selected that allows you to Display and Print the disk BAM. Allocate and free blocks and to check specific blocks. In case you are new to the term BAM the letters simply stand for Block Availability Map. It is from this area in the disk that the drive is able to discover which areas on the disk have been used. Setting blocks yourself means that you prevent the disk form using the specified area of the disk.

As you can see the range of disk related commands is quite formidable, and we've only taken a look at the first menu option.

Next on our list is the file command. Selecting this command brings up a menu of commands that allow you to carry out operations on specific files on the disk. Again a list of functions is the best way to illustrate this.

Find – reads the first sector of the specified disk file into memory.
Chain – this command lists all sectors belonging to a specific file. A program is stored in more than one place on a disk and this is your way of finding where.
Start – moves back to the start of the file found with the Find option above.
Hunt – allows you to search through a specified file for all occurrences of a specified string of data.
Lock – Commodore disk drives allow you to write protect a program on a disk so that you can't scratch it, rename it etc. Unfortunately protecting a file is quite difficult. This command makes it childs play.
Unlock – the opposite to the above.
Erase – deletes any unwanted files from disk.
Recover – we have all deleted files from a disk accidentally. This option tries to recover any erased file from the disk.
Interpret – this allows you to display disk data as Text, Basic, 6502 assembler code or as screen code. Extremely useful if you are trying to disassemble programs from disk.
Verify – checks that every file in the disk directory has the same number of blocks as shown in the directory, the readability of the file is also checked.
Display – allows you to look at the contents of any record stored in a REL file.

Going baek to the main menu we have the commands Track and Sector which allow y ou to specify which track and sector you wish to look at. Read simply reads the selected sector into the buffer while 'write' writes the buffer to the specified area on disk – carefully with this one as you can cause all sorts of damage if you don't know what you are doing.

I have already mentioned that it is possible to change the contents of the buffer. The Edit function allows you to do this. Data is entered by entering either ASCII characters or hexadecimal values. All operations are carried out in a large editing area with the cursor keys to help you move around. Once you have made changes (or not) you can get a permanent record of the sector on your printer with the print command.

Easy movement around the disk is catered for by the 'next' and 'last' commands. 'next' simply looks at the sector you are working on to find out where the next sector linked with it is stored and moves you to it. *Super Diskdoc* stores a lowest of the last 256 sectors that you have looked at. 'last' simply looks up the last sector from the list and moves you there.

The final option is similar to the file interpret command. The only difference being that this time the program does not follow the file through.

Verdict

Super Diskdoc contains within it the widest range of disk orientated commands that I have come across in one place. Sure, there are programs around that do similar things but the sheer complexity and range given by this program is unsurpassed. The program is superbly presented and the menu system makes it extremely easy to use.

You probably have a stock of elastoplast in your home just in case you happen to cut your finger. If you are serious about the use of your disk drive and the data you store, it's probably a good idea to buy a copy of this program now, just in case you corrupt your disk. You may not need it now, but wouldn't it be nice to know it's always there? YC

Touchline
Name: ***Super Diskdoc.***
Machine: ***Plus/4, C64, C128, Commodore 4000,8000,700/B128 + most disk drives.*** *Supplier:* ***Precision Software Ltd, 6 Park Terrace, Worcester Park, Surrey KT4 7JZ.*** *Tel:* ***01-330 7166.***

Disk Utility

Disk Drive owners shouldn't be without this comprehensive range of utilities from Paul Eves.

When Commodore designed the 1541 they gave it quite a complex range of built in instructions. However they did make it quite difficult to use them. This utility, given away FREE, with this issue of *Your Commodore* will make accessing your disk drive extremely easy.

Not only are the standard commands made easier to access, but a plethora of new and extremely powerful utilities have been added. For example you can now find the start address of any program or check a disk for errors.

The whole program is menu driven and extremely easy to use. Simply LOAD the program from cassette and it will automatically start. If you should want to SAVE it onto your own disk then you should press RUN/STOP and RESTORE to return to Basic, then simply SAVE it to tape or disk as you would a normal program.

When the program starts you will be asked if you want to change the colours of the screen. Once you have done this you will go to the main menu. Figure 1 shows all of the available functions, we will deal with each one in turn.

A) Alter Start Addr

As you are no doubt aware when you store a file to disk its load address is saved with the file. This function allows you to change this address so that it will LOAD at any address that you wish.

B) Convert Number

When dealing with disk programs, especially machine code, it is quite often necessary to change numbers from one base to another. This function will allow you to perform any of the following number conversions:

Hex to Decimal
Decimal to Hex
Binary to Decimal
Decimal to Binary

C) M/C Data Maker

This function will allow you to turn any machine code file that is on disk into a Basic Loader. Each byte of the specified file is read from disk and added to a basic data statement. Once the program has been converted a loader is added to the start of the Data and the progrm is saved to disk.

D) Directory Commands

This option brings up a second menu in which there are a number of extremely useful commands for handling your disk directories. Options available are:

S – List directory to screen.

This prints out a list of all programs on a disk onto the screen.

L – List directory to the printer

This does the same as the above, however, the list is sent to the Printer. A commodore printer is assumed.

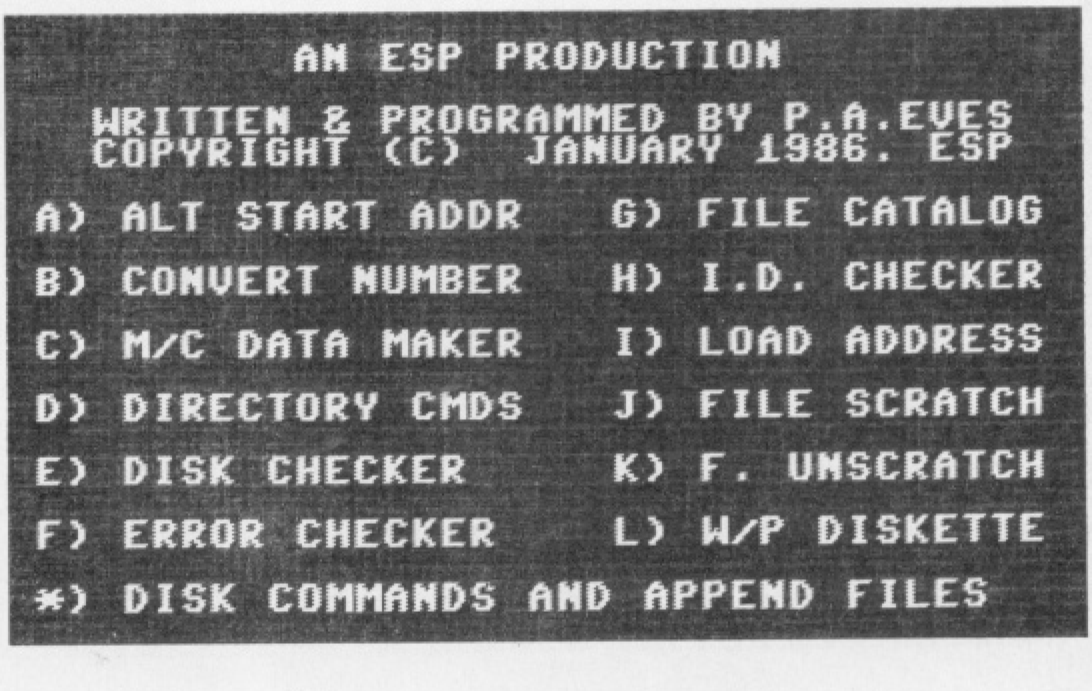
N – Write invisible directory to disk

This command alters your disk directory in such a way that you can no longer read the directory. All of the programs can still be LOADed. This is an excellent way to protect your programs from prying eyes.

E – Write no directory load to disk.

This command has a similar result to the above. However, instead of making an invisible directory it will prevent anyone from LOADing the directory into the computer.

p – Protect files against scratching.



With the Commodore disk drive it is possible to protect files against erasure. Any non-detetable files can be seen in the directory with a '<' beside the file type. Unfortunately commodore made no provision for you to use this facility easily, this option corrects that ommission.

I – read and change disk header or ID

This command is extremely useful as it allows you to change the name of any disk and its ID. You are probably aware that all of your disks should have a different ID. If you accidentally formatted one with an ID that you had already used you can change it with this command. This saves copying al of the files and re-formatting the disk.

The final option on this menu is 'Q' which will take you back to the main menu.

E) Error checker

If you should have a disk that you suspect an error may be on then you can use this command to find out if any specified track has an error on it. The type of error, if found, will be reported then you can try to fix it with a disk monitor etc.

F) Disk Checker

This option is similar to the above except that it checks the whole disk rather than asking for specific tracks.

G) File catalog

You may think that this command is similar to the one in directory commands. It does however give you more information.

When you perform this operation on a disk all files on the disk will be listed together with their start and end addresses.

H) I.D.Checker

No doubt at some time you will have come across files on a disk that simply refuse to LOAD. Quite often the cause for this is that the ID on the track has somehow become different from that in the ID of the DISK. This command allows you to check the ID in all sectors of a specified track. Once you have found your error you can correct it with a disk editor.

I) Load Address

This function will print out the load address of a specified program. This is extremely useful when used in conjunction with menu option A as you can find out where a program LOADs, change it and then check it to see if the change has been made correctly.

J) File Scratch

Option J allows you to delete specified files from disk. It is similar to the standard disk 'S' command but is much easier to use.

K) F.Unscratch

This is the File Unscratch command. When you erase a file from disk the actual file is not deleted it is only marked as being so. With this command it is possible to re-juvinate any file that has been accidentally deleted. NOTE this command will probably not work if you have SAVEd something to the disk since the scratch.

L) W/P Disk

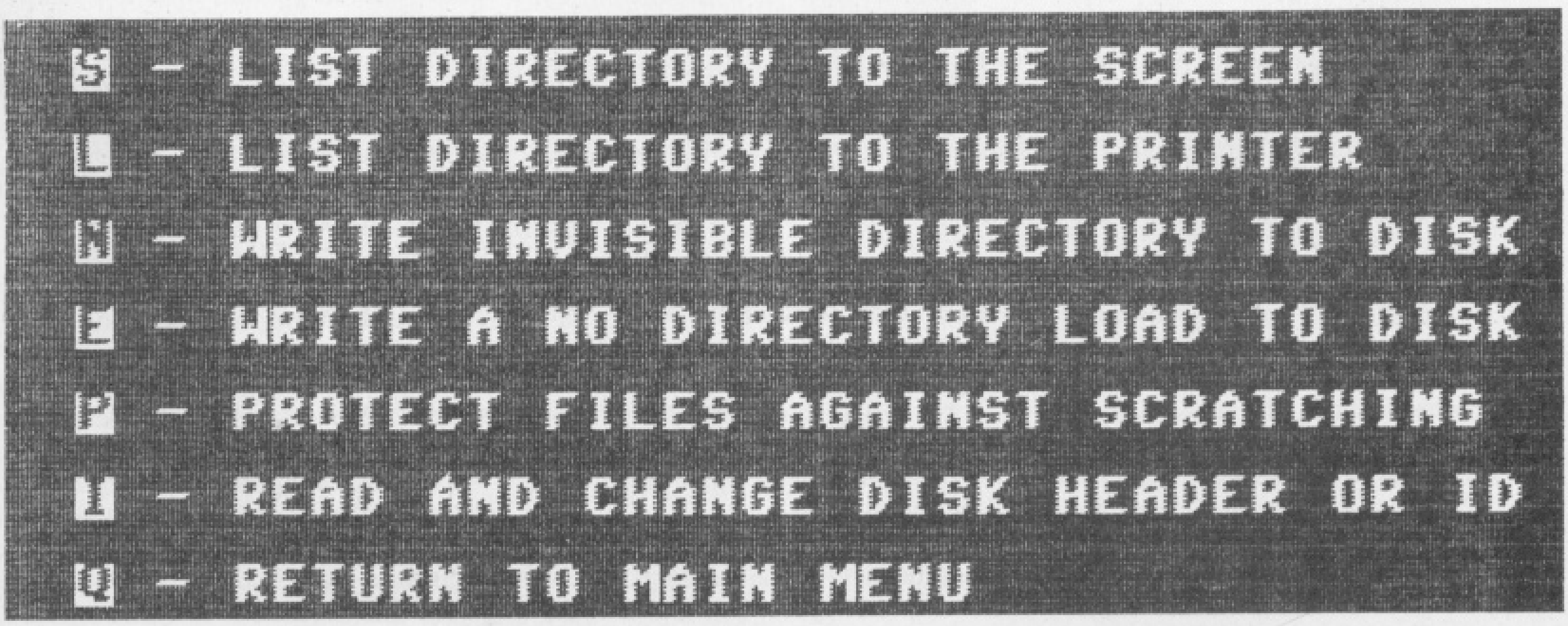
This command will make any disk write protect. This command will only work with the 1541 disk drive. The write protect is done through software and a write protect tab isn't needed. However please note that you cannot change this disk back into one that you can write to after this command.

*) Disk Commands

This function allows you to use any of the standard disk commands (a,s,n etc). If you don't know how to use them then we suggest that you refer to your disk drive manual. YC

Warning

As you can see this set of utilities is extremly powerful. If you use any of the commands without thinking then you could possibly damage the disk that you are operating on and be unable to recover the data. We therefore strongly suggest that you back up any disk that you intend to use this program on just in case you use the wrong command.



Getting it Together

If you're thinking about buying an assembler then you're probably mystified by the wide choice. Look no further to see the light.

By Allen Webb

Many of you will be contemplating or already making the move from Basic to machine code. This move can be both fun and rewarding however a lot hinges on your choice of assembler. The idea behind this article is to describe in some detail the serious assemblers around and help you in your search.

What is an Assembler?

Before launching forth, it is worthwhile considering what an assembler is and what it does.

Because we stupid humans find it difficult to write machine code directly in the form understood by the machine, we use mnemonics to allow the creation of an intelligible source code. We then use an assembler to convert the source code into object code directly usable by the machine. In order to maximise the ease of creating the source code, good quality assemblers allow you to use labels to identify variables, addresses, data tables and the destination of loops and jumps. Those of you who write complex programs will appreciate the importance of a structured approach to allow ease of understanding the workings of the program. It is particularly vital if you want to make the code intelligible to other programmers. Languages such as PASCAL allow such a sensible approach. When using machine code, the use of labels and remarks are even more important. Program 1 is a simple example of source code showing the features offered by most decent assemblers:

```
PROGRAM : 1

10 * = $C000
20 CHAROUT = $FFD2
30 TEXTSTART = $FB
40 ENDCHAR = #$00
50 ;
60 ;A ROUTINE TO PRINT A STRING OF
70 ;TEXT. THE TEXT START ADDRESS IS
80 ;HELD IN THE ACCUMULATOR AND Y
90 ;REGISTER AND THE TEXT MUST END
100 ; WITH A ZERO BYTE.
110 ;
120 PRINTTEXT STA TEXTSTART
130 STY TEXTSTART + 1
140 LDY #0
150 NEXTCHAR LDA (TEXTSTART),Y
160 BEQ FINISH
170 JSR $FFD2
180 INY
190 BNE NEXTCHAR
200 FINISH RTS
```

Hopefully you will find this example easy to follow. Since most decent assemblers allow the use of linked source files (more on that later), you can be as liberal with labels and remarks as you like. This is a powerful aid since it encourages a systematic modular approach to machine code.

Since the task of translating these labels requires some work, such assemblers use two or more "passes" to perform the translation. Such facilities are a must for any decent assembler.

Before I describe the better assemblers about, I want to discuss the features that you should check when deciding which package to go for.

Essential features

1) T he assembler must be in machine code. No I'm not a machine code snob, but if you want to assemble a decent sized piece of code, a Basic assembler will be much too slow.

2) Must offer full labels of at least six characters in length. As indicated in the example above, it's desirable to be able to use meaningful labels. Six characters is, in my opinion, the minimum acceptable.

3) Should support linked source files to allow the assembly of very large programs. Source codes are generally memory hungry with about 30K of source code needed for 4K of object code. If you're writing a 50K mega game, the combined source code will be pretty large. Any decent assembler will allow you to split the source code into several linked sections and assemble it in this form.

4) Should provide a symbol table or cross referencing option. This is extremely handy when debugging since you may want to locate the address of a loop or routine.

5) Should provide output to printer, preferably with formatting options. Again, a hard copy is a great debugging aid.

6) Should provide 'toolkit" commands to allow renumbering etc. of the source code. One important area to check is the editor used for the creation of the source code. Many assemblers use the 64's editor. This is OK but not much use on its own. Other assemblers have their own operating system and editor. These tend to be more versatile. The commands to look for as a minimum are FIND, RENUMBER, DELETE, AUTO (line numbering).

7) Should offer disassembly and some form of debugging system. You should ensure that there is a monitor in the system. This is vital for the manipulation of code. Single step execution is a useful debugging aid. The ability to disassemble the code is valuable as a check of the object code.

8) Should provide pseudo op-codes to allow the creation of data tables.

Nearly all code will need data tables. This may comprise of straight numeric data or text. The assembler should provide pseudo op-codes for single data bytes, double data words and text as ASCI codes or Commodore screen codes.

Optional features

1) macros – handy if you want to set up a library of routines but otherwise, in my view, of limited value.
2) Conditional assembly – sounds fun but seems to be more of a case of a solution searching for a problem.

So what is there on the market? I've looked at a wide range of assemblers and have compared them in Table 1.

Mikro Assembler

Those of you who have used the good old PET may recall this old favourite. Whilst being simple without frills, this assembler has a good pedigree and performs extremely well. One seious omission is the lack of a machine code monitor. Supersoft does offer the excellent ZOOM monitor but it's a bit of a pain to have to buy it separately.

Compared to the opposition, this product is a little pricey but it's reliable.

Laser Genius

This product from Ocean is one of the new breed and is the most comprehensive I've seen. It originally appeared as *Machine Lightning* from Oasis. It has been tidied up and supplemented by a debugging system of significant power.

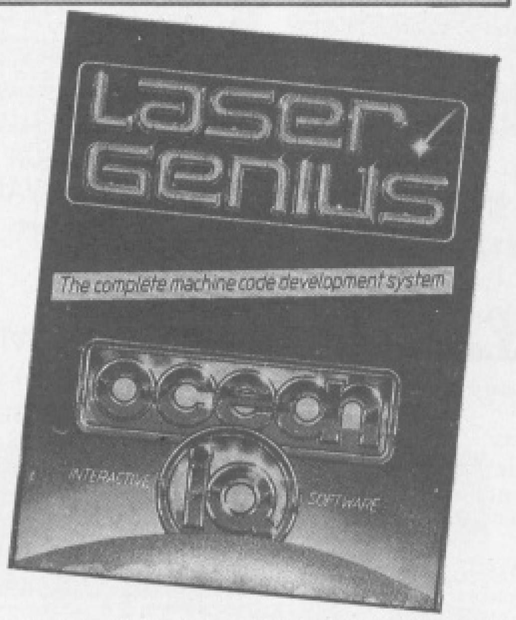
The assembler uses its own operating system and it has a wide range of features. The debugger is the best I've seen and allows the creation of user defined break definition. At the price, this is unbeatable value.

	1ST PUB	MIKRO	LASER GENIUS	MC GRAW HILL	ARROW+	SUPER HELP	ZEUS-64
TYPE	D	C	D/Cs	Cs	C	C	D
EDITOR	CBM	CBM	OWN	CBM	CBM	CBM	OWN
MONITOR	YES	YES	YES	NO	YES	YES	YES
DEBUG	YES	NO	YES	NO	NO	NO	YES
TOOLKIT	NO	*	***	NO	*	**	*
DISASSEMBLE	YES	YES	YES	YES	YES	YES	YES
PSEUDO OPS	**	*	***	*	*	*	**
HARD COPY	**	*	***	*	*	*	*
LINK FILES	YES	YES	YES	NO	NO	NO	NO
SYMBOL TABLE	YES	YES	YES	NO	YES	NO	NO
LABEL LENGTH	8	?	15	75	9	6	31
COST	19.99		19.95				14.95

Notes for Table 1

D=disk, C=cartridge, Cs=cassette.
2) I could not ascertain the maximum label length for MIKRO but I do know that it will accept at least six characters.
3) Some categories have stars showing the extent of facilities roughly they mean:

* = minimum acceptable
** = good enough
*** = couldn't ask for more.



Assembler Monitor 64

As is the case with mot of First Publishing's products, this package is of German origin. The package comprises of both the assembler and a reasonable monitor. The assembler is quite complex with Macros and conditional assembly supported. The editor is rather short on toolkit instructions which is rather a pain in the neck.

Overall, a good quality assembler which performs well with no real problems. One of my favourites.

Machine-Code Assembler/ Disassembler

This is a bit of a departure for McGraw Hill, the book publishers. The assembler is a little reminiscent of that on the BBC micro. The 64's editor is used to write the source code with multiple statements on each line allowed. The assembler is told where the source code is by use of square brackets.

Both programs are unique in their use of colours to indicate the different types of instruction. In order to maximise the RAM available, the codes are tucked behind the Basic ROM.

Not a bad package and worth a look.

Arrow +

This and the next assembler are included simply for completeness. Both were originally marketed by the now defunct STACK Computers.

Arrow + is essentially a tape turbo package. It has an assembler added as a bonus feature. The assembler is quite standard and offers no surprises. The nice addition is a disassembler which will convert object code into a fully labelled source code. This is potentially a very handy tool.

Note a bad product, and you may be able to pick it up cheap from a bankrupt stock dealer.

Super Help

This cartridge is a combination toolkit/assembler. The range of commands is good and the assembler quite adequate. There is a monitor but it's utterly diabolical. Again, you might be able to get it cheap.

ZEUS 64

Bearing in mind the trouble I had trying to reach Crystal, I suspect that they may also be defunct. Having said that, I've seen this assembler in a number of shops.

The package is an assembler/disassembler combination and is quite comprehensive albeit rather unusual in it's format. I found it a little tough to get into and the instruction booklet isn't the most lucid. Although it's disk based, it doesn't appear to support linked files.

Finally

In summary, the 64 is quite well suported with assemblers to suit all tastes. All of the assemblers I tested did the job well enough. If, however, I was to recommend three, they would be MIKRO, Laser Genius and Assembler Monitor 64. YC

C16 Sound Sampler

Now your C16 can really sound like a trombone with this excellent program.

By Gary Fry

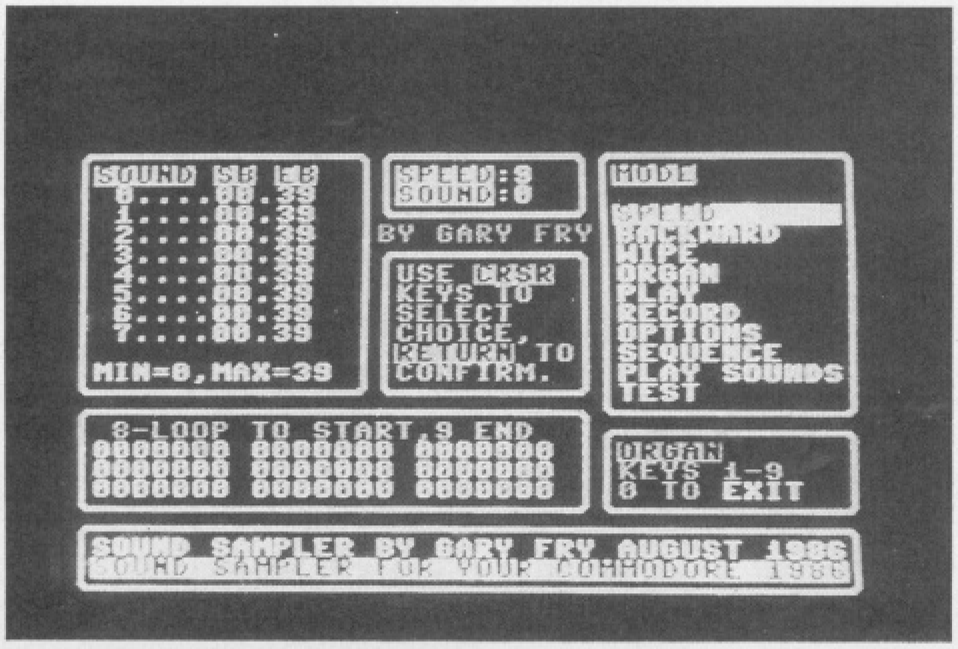
A sound sampler is a program which enables you to store any sound in memory. Once stored in memory the sound can be manipulated in various ways. Possibilities include, speed variation, reversing the sound, altering the pitch of the sound etc. You could sequence the sound like a drum machine or Paul Hardcastle's NNN Nineteen, or just use the computer keyboard as an organ, each key playing the sound at a different pitch.

This program, written for the C16 and Plus/4, allows a sample of up to two seconds to be stored in memory. This takes up a staggering 10K of the computer's memory, so you can imagine the problems getting all of the program into the C16.

Two seconds? I hear you say.

This is actually quite a lot when you think about it. Just count it to yourself. Not many sounds take longer than this, And don't forget once you have sounds in memory you can sample them to create much longer sounds.

Sampling is quite easy to do since the Commodore Datassette does quite a lot of the work for you – it converts the analogue voltages which make up the sound on a cassette into digital ones and zeros. These one's and zero's are then transferred to the computer's memory, just like a program when loading.



How It Works

In order to fill the computer's memory with the necessary ones and zeros the cassette port is read (memory location 0). A process called ORing is then used with each byte read in to read just one bit from the number read in. By rotating the number read and repeating the process eight times, eight ones or zeros are loaded in. This gives one byte of sample. This is repeated until the 10K of memory is filled. You could look at it like a cog wheel with eight teeth 'feeling' 10 holes in a long strip of paper. Each full turn of the wheel corresponding to one byte being loaded.

Playing the Sample Back

This is much the same process as reading from the cassette port, but this time it is applied to the computer memory where the sample has been stored. When a one is read an audible sound is emitted from the speaker; when a one is read, an inaudible sound (too high is made). This process produces a click. Do this a thousand times in a frction of a second, and your sound is built up.

In order to get the speed necessary for this program the screen has to be turned off during playback. This makes the computer work at almost twice normal speed.

Playing with a Sound

The organ/piano facility is probably the best facility, this reproduces the

stored sound at differing pitches, depending on the key pressed. Only keys one to eight are used, but you can have great fun.

Sequencing plays a string of samples in an ordered sequence to produce effects such as echo or a drum machine. It is possible to have up to 63 steps which can last up to two minutes, depending on the size of each sample.

Reversal allows you to play your sample backwards.

The test option allows you to play the sound from your cassette recorder through your computer, rather like a hi-fi. This doesn't affect memory and is a useful way of getting your recording where you want it.

Don't be misled about the quality of the sound – it isn't exactly studio quality. Nevertheless, you are sure to find the quality such that you can still have a lot of fun with the program.

Typing it in

You should have no problems typing in the three programs as they are all in Basic and have a checksum on each line.

When RUN, Program 1 will create a file on disk. This program is accessed by Program 2. Once this program is created on disk you will only need to use Program 2.

Sample Session

In order to make the program easier to understand we have included a sample session that should make things a little easier.

Sample Session

Insert a pre-recorded cassette into the datasette.

Move the cursor to the speed option. Press RETURN and type 4 (normal speed). Now move the cursor to the RECORD position and press RETURN. The window at the bottom should now say "PRESS PLAY" (unless of course you have the PLAY down already!).

The computer should now blank the screen for a couple of seconds, then beep and unblank the screen. You have now just sampled two seconds of whatever was on the tape.

To play a sound

Move the cursor to PLAY and press RETURN. This will now blank the screen and play your sample – please note tht the more tracks on the sample the poorer the sound. If you are still not happy with the sound as it is, change the speed.

To use the sample like an organ, move the cursor down to ORGAN. Now use keys one to nine to play a tune. Key six is about the same pitch as the original sample (depending on the actual speed)

Key zero brings you back to the menu.

Playing about with the sound

If you want to tidy up your sample, play any part of it, move the cursor to the OPTIONS function and press RETURN.

At the bottom window, it should now say SOUND. This is asking you for which sample you want to use you can reply any number from zero to seven. Press zero for sound zero. The computer should now say SB. This stands for starting block (zero to 39) but it is best to use zero to 35 because four blocks isn't a lot of sample. Then the computer will ask you the ending block (EB) this can be any number between the starting block number (the number you have just typed in) to number 39. Go to the ORGAN and try that! If you are still not satisfied, go to the OPTIONS function and try again!

You can also have multiple samples in memory at the same time in different blocks of memory using the OPTIONS function. Before recording a sample, go to the OPTIONS function and determine which part of memory you wish to use.

Sequencing sounds

Whatever sounds you have in memory, you can put them into an orderly sequence and produce some interesting effects.

Say sound one was a bass drum and sound two was a hand clap, you can make these sounds play a rhythm. Try this: Go to SEQUENCE mode, and the window at the bottom will ask you if you want to play the sequence or edit it.

Type E for edit and then press RETURN.

Now type:

1212219

What this does is to get the numbers from left to right and to play that sound number. Sound one was a bass drum so the number one will play a base drum, sound two was a hand clap so the number two will play a hand clap and so on.

The number nine simply ends the sequence.

The number eight (not in the sequence) loops the sequence (goes back to the beginning) and plays all over again. Pressing any key will exit the option.

Producing an echo

Say you have a sample which says "hello" from blocks 00 to 15. You can produce an echo by doing this: (going to options mode each time):

SOUND 0 SB 00 EB 06
SOUND 1 SB 03 EB 09
SOUND 2 SB 06 EB 12
SOUND 3 SB 09 EB 15

Now go to sequence mode and type E for edit and press RETURN.

Type: 01239000 then N after the prompt "CONTINUE?" at the bottom window.

Voilla! You have an echo!

Please note that you cannot use the INST/DEL key in this mode, or any other mode. Also you have to type in seven numbers when editing the sequence simply because of memory limitations.

Erasing Sounds

To erase a current sound from memory, go to WIPE and press return. **Warning:** You have no "ARE YOU SURE?" prompt so you only have one chance.

Reversal

This just plays the current sound backwards. You cannot use it in SEQUENCE or ORGAN mode.

To play your sound backwards, go to BACKWARDS and press RETURN

Playing all sounds in memory

Doing this saves quite a lot of time. What it does is play the sounds zero through to seven in order, without going to the OPTIONS function eight times!

Test

You can use this function to get a sample ready or play the tape just to listen to it.

To get to this, go to the TEST function and press RETURN

Loading and saving sounds

Keep note of the starting blocks and the ending blocks of the sounds that you want to save.

If you have a datasette it's not really worth saving your sample (unless you think its brilliant!) it's just like loading a commercial program!

You cannot save or load a sample in the program so you'll have to exit to TEDMON.

To get to TEDMON, you have to HOLD DOWN RUN/STOP and press RESET on the side of the computer, let go of the RESET button while still holding down RUN/STOP.

The computer will now exit to TEDMON (you can let go of RUN/STOP now!)

If you want to save sound zero type:

M 0060 0060

The computer should now say:

0060 17 30 xx xx xx xx xx xx .0......

or something! Please ignore the xx's they mean other sounds.

Now type:

S"sample name",08,1700,3000

Or to tape:

S"sample name",01,1700,3000

Here is a table for saving each sound number:

SOUND NUMBER	YOU TYPE
0	M 0060 0060
1	M 0062 0062
2	M 0064 0064
3	M 0066 0066
4	M 0068 0068
5	M 006A 006A
6	M 006C 006C
7	M 006E 006E

Loading

Load the SAMPLER (from basic) Load the samples that you wish by typing:

LOAD "sample name",8,1 (for disk)
LOAD "sample name",1,1 (for cassette)

When you have loaded all the samples type:

RUN

The screen will now load and off you go! YC

PROGRAM: RELOCATE

```
10POKE44,25:POKE6400,0:CLR:NEW
20 :
30 REM****************************
*******
40 REM* RUN THIS PROGRAM BEFORE
YOU   *
50 REM* RUN EITHER OF THE LOADER
S.    *
60 REM* IF YOU DO NOT THE PROGRA
MS    *
70 REM* WILL NOT WORK CORRECTLY.
      *
80 REM****************************
*******
```

PROGRAM: SAMPLER PT1

```
 10PRINT"[CLEAR]WORKING HARD....
":L=100:AD=4096
 20CK=0:FORX=0TO7:READM$:M=DEC(M
$):POKEAD+X,M:CK=CK+M
 30NEXTX:READCH$:IFDEC(CH$)<>CKT
HENPRINT"DATA ERROR AT LINE:"L:E
ND
 40AD=AD+8:L=L+5:IFL=1085 THENPR
INT"DATA ENTERED CORRECTLEY.":GO
TO60
 50GOTO 20
 60FORM=1TO1000:NEXTM:SCNCLR
 65TD$="01":INPUT"ARE YOU USING
TAPE OR DISC? (T/D)";TX$:IFTX$="
D"THENTD$="08"
 70SCNCLR:CHAR1,0,3,"M[SO]":CHAR
1,0,9,"S"+CHR$(34)+"SAMPLER"+CHR
$(34)+","+TD$
 80PRINT",1001,1630[HOME]":POKE1
319,13:POKE1320,13:POKE1321,88:P
OKE1322,13:POKE239,4
 85POKE4115,VAL(TD$)
 90END
 100DATA 00,0B,10,0A,00,9E,34,31
,0128
 105DATA 31,32,00,00,00,53,43,00
,00F9
 110DATA A9,00,A2,08,A0,01,20,BA
,02CE
 115DATA FF,A9,04,A2,2A,A0,10,20
,0348
 120DATA BD,FF,A9,00,20,D5,FF,4C
,04A5
 125DATA 35,15,53,43,52,4E,A9,92
,02BB
 130DATA 85,D8,A9,0C,85,D9,A2,00
,0412
 135DATA A0,0B,B1,D8,49,80,91,D8
,0466
 140DATA 88,D0,F7,20,91,10,C9,91
,046A
 145DATA F0,0B,C9,11,F0,1F,C9,0D
,03BA
 150DATA F0,47,4C,43,10,E0,00,F0
,03A6
 155DATA EA,20,85,10,38,A5,D8,E9
,043D
 160DATA 28,85,D8,A5,D9,E9,00,85
,0471
 165DATA D9,CA,4C,38,10,E0,09,F0
,0410
 170DATA D2,20,85,10,18,A5,D8,69
,0385
 175DATA 28,85,D8,A5,D9,69,00,85
,03F1
 180DATA D9,E8,4C,38,10,A0,0B,B1
,03B1
 185DATA D8,49,80,91,D8,88,D0,F7
,0559
 190DATA 60,86,FF,20,E4,FF,A6,FF
,058D
 195DATA 60,86,DB,18,8A,65,DB,65
,0408
 200DATA DB,69,A9,8D,A7,10,4C,BE
,043B
 205DATA 10,4C,76,11,4C,8E,11,4C
,021A
 210DATA CD,11,4C,EA,11,4C,06,12
,0289
 215DATA 4C,0F,12,4C,FD,12,4C,98
,02AC
 220DATA 15,4C,A9,12,4C,76,12,A9
,0299
 225DATA C7,8D,12,FF,A9,FE,8D,0E
,04A7
 230DATA FF,60,A0,0B,B1,D8,49,80
,045C
 235DATA 91,D8,88,D0,F7,A2,25,A9
,0528
 240DATA 20,9D,20,0F,CA,D0,FA,A0
,0420
 245DATA 0B,B1,D8,99,20,0F,88,D0
,03B4
 250DATA F8,60,A5,DA,18,20,C2,11
,03E2
 255DATA B5,60,85,D9,A9,00,85,D8
,0479
 260DATA B5,61,85,DC,60,A5,D9,48
,049D
 265DATA A5,DC,85,D9,68,85,DC,60
,0508
 270DATA F0,04,A9,15,D0,02,A9,00
,032D
 275DATA 8D,11,FF,60,20,90,12,20
,02DF
 280DATA C7,10,A0,00,B1,D8,A6,DD
,0483
 285DATA 48,29,80,20,10,11,68,2A
,01C4
 290DATA CA,D0,F5,20,FA,15,C8,D0
,0556
 295DATA EB,20,53,15,C5,DC,90,E4
,0488
 300DATA 60,EA,EA,EA,20,E4,FF,F0
,0611
 305DATA FB,18,C9,30,90,F6,C5,DE
,0535
 310DATA B0,F2,60,A2,00,A9,17,95
,03F9
 315DATA 60,A9,3E,95,61,E8,E8,E0
,04ED
 320DATA 11,90,F2,A9,00,85,DA,A9
,0444
 325DATA 01,85,DF,A9,3F,85,DC,A9
,0457
 330DATA 09,85,DD,4C,BC,11,20,D2
,0376
 335DATA 10,20,F2,10,A9,3A,85,DE
,0378
 340DATA 20,44,11,8D,3E,0C,38,E9
,026D
 345DATA 30,85,DD,4C,9B,12,20,D2
,037D
 350DATA 10,20,90,12,20,05,11,A0
,01A8
 355DATA FF,A6,DD,B1,D8,48,29,01
,047D
 360DATA 20,10,11,68,6A,CA,D0,F5
,03A2
 365DATA 88,D0,EE,38,A5,D9,E9,01
,04E6
 370DATA 85,D9,18,C5,DC,B0,E2,4C
,04F5
 375DATA 9B,12,EA,EA,20,C7,10,4C
,03C4
 380DATA 9B,12,65,DA,AA,C9,11,B0
```

```
,0420
 385DATA 01,60,A2,00,60,20,D2,10
,0265
 390DATA 20,90,12,A0,00,A9,00,91
,029C
 395DATA D8,C8,D0,FB,20,53,15,C5
,04B8
 400DATA DC,30,F2,4C,9B,12,EA,EA
,04CB
 405DATA EA,EA,20,D2,10,A9,3A,85
,043E
 410DATA DE,20,44,11,38,E9,30,F0
,0394
 415DATA 0A,20,A7,15,EA,20,1C,11
,021D
 420DATA 4C,F1,11,4C,9B,12,20,D2
,0339
 425DATA 10,20,1C,11,4C,9B,12,20
,0176
 430DATA D2,10,A5,01,29,08,F0,10
,02B9
 435DATA A0,0B,B9,27,E3,49,40,99
,0390
 440DATA 20,0F,88,D0,F5,4C,12,12
,02EC
 445DATA 20,90,12,A0,00,A9,00,A2
,02AD
 450DATA 09,48,A5,01,29,10,D0,31
,0231
 455DATA 68,09,01,2A,CA,D0,F2,91
,03B9
 460DATA D8,C8,D0,E9,A2,01,CA,D0
,0596
 465DATA FD,20,61,15,EA,C5,DC,30
,044E
 470DATA DC,A9,00,8D,0E,FF,A9,18
,03E0
 475DATA 8D,11,FF,88,D0,FD,CA,D0
,058C
 480DATA FA,A9,10,8D,11,FF,4C,9B
,0437
 485DATA 12,68,4C,3B,12,EA,EA,EA
,03D1
 490DATA EA,EA,EA,EA,EA,EA,20,A3
,063F
 495DATA 12,A5,C6,C9,40,D0,FA,A5
,04F5
 500DATA 01,29,10,20,10,11,A5,C6
,01E6
 505DATA C9,40,F0,F3,4C,9B,12,00
,03E5
 510DATA AD,06,FF,29,EF,8D,06,FF
,045C
 515DATA 4C,F2,10,A9,1B,8D,06,FF
,03A4
 520DATA 4C,40,15,20,D2,10,4C,90
,027F
 525DATA 12,20,D2,10,A5,DA,48,A9
,0384
 530DATA 00,48,85,DA,20,1C,11,18
,020C
 535DATA 68,69,01,C9,08,F0,0D,A0
,0340
 540DATA 80,A2,FF,CA,D0,FD,88,D0
,0610
 545DATA FA,4C,B1,12,68,85,DA,4C
,041C
 550DATA 9B,12,A2,00,A9,20,9D,21
,02D6
 555DATA 0F,E8,E0,25,D0,F8,60,A9
,04CD
 560DATA 2A,85,E0,A9,0C,85,E1,A6
,0450
 565DATA DA,18,A5,E0,69,28,85,E0
,046D
 570DATA A5,E1,69,00,85,E1,CA,10
,042F
 575DATA F0,60,EA,EA,EA,20,D2,10
,0510
 580DATA 20,D2,12,A0,00,B9,29,0C
,0292
 585DATA 99,21,0F,C8,C0,05,D0,F5
,041B
 590DATA 20,E4,FF,C9,30,90,F9,C9
,054E
 595DATA 38,B0,F5,8D,66,0C,38,E9
,03FD
 600DATA 30,85,DA,85,E2,20,DF,12
,0407
 605DATA A0,00,20,D2,12,A9,13,8D
```

```
,02ED
 610DATA 21,0F,A9,02,8D,22,0F,20
,01B9
 615DATA E4,FF,C9,34,B0,F9,C9,30
,0582
 620DATA 90,F5,38,E9,30,85,D8,85
,04B8
 625DATA E2,20,DF,12,A0,05,A5,D8
,0415
 630DATA 18,69,30,91,E0,20,E4,FF
,0425
 635DATA C9,30,90,F9,C9,3A,B0,F5
,052A
 640DATA 38,E9,30,85,D9,85,E2,20
,0436
 645DATA DF,12,A0,06,A5,D9,18,69
,0396
 650DATA 30,91,E0,20,83,13,18,A5
,0314
 655DATA DA,20,C2,11,A5,D8,95,60
,043F
 660DATA 4C,95,13,A9,00,A6,D8,18
,0333
 665DATA 69,0A,CA,10,FA,18,69,0D
,02D5
 670DATA 65,D9,85,D8,60,20,D2,12
,03FF
 675DATA A9,05,8D,21,0F,A9,02,8D
,02A3
 680DATA 22,0F,20,E4,FF,C9,30,90
,03BD
 685DATA F9,C9,34,B0,F5,38,E9,30
,04EC
 690DATA 85,D8,85,E2,20,DF,12,A5
,047A
 695DATA D8,18,69,30,A0,08,91,E0
,03A2
 700DATA 20,E4,FF,C9,30,90,F9,C9
,054E
 705DATA 3A,B0,F5,38,E9,30,85,D9
,048E
 710DATA 85,E2,20,DF,12,A5,D9,18
,040E
 715DATA 69,30,A0,09,91,E0,20,83
,0356
 720DATA 13,18,A5,DA,20,C2,11,A5
,0342
 725DATA D8,95,61,4C,2E,10,A9,59
,035A
 730DATA 85,D8,A9,0E,85,D9,A9,00
,041B
 735DATA 85,E2,85,E3,A0,00,20,1B
,03AA
 740DATA 14,20,E4,FF,C9,91,F0,21
,0482
 745DATA C9,1D,F0,32,C9,11,F0,58
,042A
 750DATA C9,9D,F0,69,C9,0D,F0,7D
,0502
 755DATA 4C,01,14,A0,00,B1,D8,49
,02D3
 760DATA 80,91,D8,C8,C0,07,D0,F5
,053D
 765DATA 60,A5,E3,C9,00,F0,D2,C6
,0539
 770DATA E3,20,1B,14,38,A5,D8,E9
,03D0
 775DATA 28,85,D8,4C,FE,13,A5,E2
,0469
 780DATA C9,02,F0,BD,E6,E2,20,1B
,047B
 785DATA 14,18,A5,D8,69,08,85,D8
,0377
 790DATA 4C,FE,13,F0,AC,20,7E,14
,03AB
 795DATA 38,A5,D8,E9,28,85,D8,A5
,04C8
 800DATA D9,E9,00,85,D9,4C,FE,13
,047D
 805DATA A5,E3,C9,02,F0,93,20,1B
,0411
 810DATA 14,E6,E3,18,A5,D8,69,28
,0403
 815DATA 85,D8,4C,FE,13,A5,E2,C9
,050A
 820DATA 00,D0,03,4C,01,14,20,1B
,016F
 825DATA 14,C6,E2,38,A5,D8,E9,08
,0462
 830DATA 85,D8,4C,FE,13,4C,A1,14
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,03BB
 835DATA EA,EA,EA,20,D2,10,4C,EE
,04FA
 840DATA 13,20,D2,12,A0,00,98,48
,0297
 845DATA 20,E4,FF,F0,FB,C9,30,90
,0577
 850DATA F7,C9,3A,B0,F3,AA,68,A8
,0557
 855DATA 8A,99,21,0F,91,D8,C8,C0
,0444
 860DATA 07,D0,E3,4C,D0,14,03,0F
,02FC
 865DATA 0E,14,09,0E,15,05,3F,EA
,017C
 870DATA A0,09,B9,C5,14,99,20,0F
,0303
 875DATA 88,D0,F7,A0,00,98,A6,E3
,0510
 880DATA 18,69,15,CA,10,FA,38,E9
,038B
 885DATA 15,A6,E2,18,69,07,CA,10
,02FF
 890DATA FA,38,E9,07,AA,A0,00,B1
,041D
 895DATA D8,38,E9,30,9D,AE,15,C8
,0451
 900DATA E8,C0,07,D0,F2,20,E4,FF
,0574
 905DATA F0,FB,C9,59,D0,03,4C,EE
,051A
 910DATA 13,A0,00,B9,AE,15,C9,08
,0300
 915DATA F0,F7,C9,09,F0,40,85,DA
,0548
 920DATA 98,48,20,1C,11,20,E4,FF
,0330
 925DATA D0,06,68,A8,C8,4C,19,16
,0329
 930DATA 4C,23,16,EA,12,A9,90,8D
,0347
 935DATA 19,FF,8D,15,FF,4C,53,11
,0369
 940DATA A5,DD,18,69,30,8D,3E,0C
,030A
 945DATA A5,DA,18,69,30,8D,66,0C
,032F
 950DATA 4C,2E,10,E6,D9,A5,D9,C9
,0490
 955DATA 40,B0,01,60,68,68,4C,9B
,0308
 960DATA 12,E6,D9,A5,D9,C9,40,B0
,0508
 965DATA 01,60,68,68,4C,51,12,A0
,0280
 970DATA 09,B9,8E,15,99,21,0F,88
,02B6
 975DATA 10,F7,20,E4,FF,C9,45,D0
,04E8
 980DATA 03,4C,9B,14,C9,50,D0,F2
,03D9
 985DATA 20,D2,10,4C,11,15,10,0C
,0190
 990DATA 01,19,2F,05,04,09,14,3F
,00AE
 995DATA 20,D2,12,4C,6F,15,20,FF
,02F3
 1000DATA 00,A6,DF,CA,D0,FD,60,A
8,0524
 1005DATA B9,F0,15,85,DF,60,00,0
0,0382
 1010DATA 00,00,00,00,00,00,00,0
0,0000
 1015DATA 00,00,00,00,00,00,00,0
0,0000
 1020DATA 00,00,00,00,00,00,00,0
0,0000
 1025DATA 00,00,00,00,00,00,00,0
0,0000
 1030DATA 00,00,00,00,00,00,00,0
0,0000
 1035DATA 00,00,00,00,00,00,00,0
0,0000
 1040DATA 00,00,00,00,00,00,00,0
0,0000
 1045DATA 00,00,00,00,00,00,FF,F
F,01FE
 1050DATA 40,33,27,22,1A,17,12,0
D,010C
 1055DATA 08,06,A5,C6,C9,40,F0,0
```

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3,0375
 1060DATA 4C,A1,15,AD,A7,10,C9,B
5,03E4
 1065DATA F0,F6,C9,BE,F0,F2,C9,C
1,06D9
 1070DATA F0,EE,A5,DC,85,D9,4C,A
1,05AA
 1075DATA 15,C0,3F,F0,03,4C,13,1
5,027B
 1080DATA 4C,9B,12,68,4C,9B,12,0
0,025A
```

PROGRAM: SAMPLER PT2

```
 10AD=2047:L=100
 20COLOR0,1,1:COLOR4,1,1:PRINT"[
WHITE][CLEAR]WORKING HARD..."
 30CK=0:FORM=0TO7:READD$:D=DEC(D
$):POKEAD+M,D:CK=CK+D:NEXTM
 40READCK$:IFCK<>DEC(CK$)THENPRI
NT"DATA ERROR AT LINE:"L:END
 50L=L+5:AD=AD+8:IFAD>4030THENCH
AR1,0,23,CHR$(27)+"T":GOTO70
 60GOTO 30
 70FORM=1TO1000:NEXTM:SCNCLR
 80INPUT"ARE YOU USING TAPE OR D
ISC? (T/D)";TX$
 90IFTX$="D"THENDV=8:ELSEDV=1
 95GOTO 1365
 100DATA 55,6F,6F,6F,6F,6F,6F,6F
,035E
 105DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 110DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 115DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 120DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 125DATA 6F,6F,51,51,51,51,51,6F
,02E2
 130DATA 51,51,6F,51,51,6F,6F,6F
,0300
 135DATA 6F,51,51,51,51,51,6F,6F
,02E2
 140DATA 6F,6F,6F,6F,51,51,51,51
,0300
 145DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 150DATA 6F,6F,6F,6B,6B,6B,6B,6B
,0364
 155DATA 6B,6B,6B,6B,6B,6F,6F,6F
,0364
 160DATA 6F,51,51,51,51,51,6F,6F
,02E2
 165DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 170DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 175DATA 6F,6F,6F,6B,6B,6B,6B,6B
,0364
 180DATA 6F,6F,6B,6F,6F,6F,6F,6F
,0374
 185DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 190DATA 6F,6F,6F,6F,7F,7F,7F,7F
,03B8
 195DATA 7F,7F,7F,7F,7F,7F,7F,6F
,03E8
 200DATA 6F,6F,6F,6B,6B,6B,6B,6B
,0364
 205DATA 6B,6B,6B,6B,6B,6F,6F,6F
,0364
 210DATA 25,25,25,25,25,25,25,25
,0128
 215DATA 25,25,25,6F,7F,7F,7F,7F
,02DA
 220DATA 7F,7F,7F,7F,7F,7F,7F,6F
,03E8
 225DATA 6F,6F,6F,6B,6B,6B,6B,6B
,0364
 230DATA 6B,6B,6B,6F,6F,6F,6F,6F
,036C
 235DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 240DATA 6F,6F,6F,6F,7F,7F,7F,7F
,03B8
 245DATA 7F,7F,7F,7F,7F,7F,7F,6F
,03E8
 250DATA 6F,6F,6F,6B,6B,6B,6B,6B
,0364
 255DATA 6B,6B,6B,6B,6B,6F,6F,6F
,0364
 260DATA 6F,3B,3B,3B,6F,3B,3B,3B
,0240
 265DATA 3B,6F,6F,6F,7F,7F,7F,7F
,0384
 270DATA 7F,7F,7F,7F,7F,7F,7F,6F
,03E8
 275DATA 6F,6F,6F,6B,6B,6B,6B,6B
,0364
 280DATA 6B,6B,6B,6B,6B,6F,6F,6F
,0364
 285DATA 6F,3B,3B,3B,3B,3B,3B,3B
,020C
 290DATA 6F,6F,6F,6F,7F,7F,7F,7F
,03B8
 295DATA 7F,7F,7F,7F,7F,7F,7F,6F
,03E8
 300DATA 6F,6F,6F,6B,6B,6B,6B,6B
,0364
 305DATA 6B,6B,6B,6B,6B,6F,6F,6F
,0364
 310DATA 6F,3B,3B,3B,3B,3B,3B,3B
,020C
 315DATA 6F,6F,6F,6F,7F,7F,7F,7F
,03B8
 320DATA 7F,7F,7F,7F,7F,7F,7F,6F
,03E8
 325DATA 6F,6F,6F,6B,6B,6B,6B,6B
,0364
 330DATA 6B,6B,6B,6B,6B,6F,6F,6F
,0364
 335DATA 6F,3B,3B,3B,3B,3B,3B,3B
,020C
 340DATA 6F,6F,6F,6F,7F,7F,7F,7F
,03B8
 345DATA 7F,7F,7F,7F,7F,7F,7F,6F
,03E8
 350DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 355DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 360DATA 6F,3B,3B,3B,3B,3B,3B,3B
,020C
 365DATA 3B,3B,6F,6F,7F,7F,7F,7F
,0350
 370DATA 7F,7F,7F,7F,7F,7F,7F,6F
,03E8
 375DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 380DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 385DATA 6F,3B,3B,3B,3B,3B,3B,3B
,020C
 390DATA 3B,6F,6F,6F,7F,7F,7F,7F
,0384
 395DATA 7F,7F,7F,7F,7F,7F,7F,6F
,03E8
 400DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 405DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 410DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 415DATA 6F,6F,6F,6F,7F,7F,7F,7F
,03B8
 420DATA 7F,7F,7F,7F,7F,7F,7F,6F
,03E8
 425DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 430DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 435DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 440DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 445DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 450DATA 6F,6F,32,32,32,32,32,32
,020A
 455DATA 32,32,32,32,32,32,32,32
,0190
 460DATA 32,32,32,32,32,32,32,32
,0190
 465DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 470DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 475DATA 6F,6F,56,56,56,56,56,56
,02E2
 480DATA 56,56,56,56,56,56,56,56
,02B0
 485DATA 56,56,56,56,56,56,56,56
,02B0
 490DATA 56,6F,6F,6F,3B,3B,3B,3B
,028F
 495DATA 3B,6F,6F,6F,6F,6F,6F,6F
,0344
 500DATA 6F,6F,56,56,56,56,56,56
,02E2
 505DATA 56,56,56,56,56,56,56,56
,02B0
 510DATA 56,56,56,56,56,56,56,56
,02B0
 515DATA 56,6F,6F,6B,3B,3B,3B,3B
,028B
 520DATA 3B,3B,3B,3B,6F,6F,6F,6F
,02A8
 525DATA 3B,6F,5A,5A,5A,5A,5A,5A
,02C6
 530DATA 5A,5A,5A,5A,5A,5A,5A,5A
,02D0
 535DATA 5A,5A,5A,5A,5A,5A,5A,5A
,02D0
 540DATA 5A,6F,6F,6F,3B,3B,3B,3B
,0293
 545DATA 3B,7F,7F,7F,7F,6F,6F,6F
,0384
 550DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 555DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 560DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 565DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 570DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 575DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 580DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 585DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 590DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 595DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 600DATA 6F,6F,71,71,71,71,71,71
,0384
 605DATA 71,71,71,71,71,71,71,71
,0388
 610DATA 71,71,71,71,71,71,71,71
,0388
 615DATA 71,71,71,71,71,71,71,71
,0388
 620DATA 71,71,71,71,71,71,71,6F
,0386
 625DATA 6F,6B,71,71,71,71,71,71
,0380
 630DATA 71,71,71,71,71,71,71,71
,0388
 635DATA 71,71,71,71,71,71,71,71
,0388
 640DATA 71,71,71,71,71,71,71,71
,0388
 645DATA 71,71,71,71,71,71,71,6B
,0382
 650DATA 7F,6F,6F,6F,6F,6F,6F,6F
,0388
 655DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 660DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 665DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 670DATA 6F,6F,6F,6F,6F,6F,6F,6F
,0378
 675DATA 6F,00,00,00,00,00,00,00
,006F
 680DATA 00,00,00,00,00,00,00,00
,0000
 685DATA 00,00,00,00,00,00,00,00
,0000
 690DATA 00,00,00,00,00,00,00,00
,0000
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 695DATA 00,00,00,00,00,00,00,00
,0000
 700DATA 00,00,00,00,00,00,00,00
,0000
 705DATA 00,00,00,00,00,00,00,00
,0000
 710DATA 00,00,00,00,00,00,00,00
,0000
 715DATA 00,00,00,00,00,00,00,00
,0000
 720DATA 00,00,00,00,00,00,00,00
,0000
 725DATA 00,7F,7F,80,80,7F,7F,80
,037C
 730DATA 80,7F,7F,80,80,7F,7F,80
,03FC
 735DATA 80,7F,7F,80,80,7F,7F,80
,03FC
 740DATA 80,55,40,40,40,40,40,40
,0255
 745DATA 40,40,40,40,40,40,40,49
,0209
 750DATA 55,40,40,40,40,40,40,40
,0215
 755DATA 40,40,49,55,40,40,40,40
,021E
 760DATA 40,40,40,40,40,40,40,49
,0209
 765DATA 20,5D,93,8F,95,8E,84,20
,0366
 770DATA 93,82,20,85,82,20,20,5D
,02D9
 775DATA 5D,93,90,85,85,84,3A,39
,0381
 780DATA 20,20,5D,5D,8D,8F,84,85
,031F
 785DATA 20,20,20,20,20,20,20,5D
,013D
 790DATA 20,5D,20,30,2E,2E,2E,2E
,0185
 795DATA 30,30,2E,33,39,20,20,5D
,0197
 800DATA 5D,93,8F,95,8E,84,3A,30
,0390
 805DATA 20,20,5D,5D,20,20,20,20
,017A
 810DATA 20,20,20,20,20,20,20,5D
,013D
 815DATA 20,5D,20,31,2E,2E,2E,2E
,0186
 820DATA 30,30,2E,33,39,20,20,5D
,0197
 825DATA 4A,40,40,40,40,40,40,40
,020A
 830DATA 40,40,4B,5D,13,10,05,05
,0155
 835DATA 04,20,20,20,20,20,20,5D
,0121
 840DATA 20,5D,60,32,2E,2E,2E,2E
,01C7
 845DATA 30,30,2E,33,39,20,20,5D
,0197
 850DATA 02,19,20,07,01,12,19,20
,008E
 855DATA 06,12,19,5D,02,01,03,0B
,009F
 860DATA 17,01,12,04,20,20,20,5D
,00EB
 865DATA 20,5D,20,33,2E,2E,2E,2E
,0188
 870DATA 30,30,2E,33,39,20,20,5D
,0197
 875DATA 55,40,40,40,40,40,40,40
,0215
 880DATA 40,40,49,5D,17,09,10,05
,015B
 885DATA 20,20,20,20,20,20,20,5D
,013D
 890DATA 20,5D,20,34,2E,2E,2E,2E
,0189
 895DATA 30,30,2E,33,39,20,20,5D
,0197
 900DATA 5D,15,13,05,20,83,92,93
,0252
 905DATA 92,20,5D,5D,0F,12,07,01
,0195
 910DATA 0E,20,20,20,20,20,20,5D
,012B
 915DATA 20,5D,20,35,2E,2E,2E,2E
,018A
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 920DATA 30,30,2E,33,39,20,20,5D
,0197
 925DATA 5D,0B,05,19,13,20,14,0F
,00DC
 930DATA 20,20,5D,5D,10,0C,01,19
,0130
 935DATA 20,20,20,20,20,20,20,5D
,013D
 940DATA 20,5D,20,36,2E,2E,2E,2E
,018B
 945DATA 30,30,2E,33,39,20,20,5D
,0197
 950DATA 5D,13,05,0C,05,03,14,20
,00BD
 955DATA 20,20,5D,5D,12,05,03,0F
,0123
 960DATA 12,04,20,20,20,20,20,5D
,0113
 965DATA 20,5D,20,37,2E,2E,2E,2E
,018C
 970DATA 30,30,2E,33,39,20,20,5D
,0197
 975DATA 5D,03,08,0F,09,03,05,2C
,00B4
 980DATA 20,20,5D,5D,0F,10,14,09
,0136
 985DATA 0F,0E,13,20,20,20,20,5D
,010D
 990DATA 20,5D,20,20,20,20,20,20
,013D
 995DATA 20,20,20,20,20,20,20,5D
,013D
 1000DATA 5D,92,85,94,95,92,8E,2
0,03DD
 1005DATA 14,0F,5D,5D,13,05,11,1
5,011B
 1010DATA 05,0E,03,05,20,20,20,5
D,00D8
 1015DATA 20,5D,0D,09,0E,3D,30,2
C,013A
 1020DATA 0D,01,18,3D,33,39,20,5
D,014C
 1025DATA 5D,03,0F,0E,06,09,12,0
D,00AB
 1030DATA 2E,20,5D,5D,10,0C,01,1
9,013E
 1035DATA 20,13,0F,15,0E,04,13,5
D,00D9
 1040DATA 20,4A,40,40,40,40,40,4
0,01EA
 1045DATA 40,40,40,40,40,40,40,4
B,020B
 1050DATA 4A,40,40,40,40,40,40,4
0,020A
 1055DATA 40,40,4B,5D,14,05,13,1
4,0168
 1060DATA 20,20,20,20,20,20,20,5
D,013D
 1065DATA 20,55,40,40,40,40,40,4
0,01F5
 1070DATA 40,40,40,40,40,40,40,4
0,0200
 1075DATA 40,40,40,40,40,40,40,4
0,0200
 1080DATA 40,40,49,4A,40,40,40,4
0,0213
 1085DATA 40,40,40,40,40,40,40,4
B,020B
 1090DATA 20,5D,20,38,2D,0C,0F,0
F,012C
 1095DATA 10,20,14,0F,20,13,14,0
1,009B
 1100DATA 12,14,2C,39,20,05,0E,0
4,00C2
 1105DATA 20,20,5D,55,40,40,40,4
0,01F2
 1110DATA 40,40,40,40,40,40,40,4
9,0209
 1115DATA 20,5D,30,30,30,30,30,3
0,019D
 1120DATA 30,20,30,30,30,30,30,3
0,0170
 1125DATA 30,20,30,30,30,30,30,3
0,0170
 1130DATA 30,20,5D,5D,8F,92,87,8
1,0333
 1135DATA 8E,20,20,20,20,20,20,5
D,01AB
 1140DATA 20,5D,30,30,30,30,30,3
0,019D
```

```
 1145DATA 30,20,30,30,30,30,30,3
0,0170
 1150DATA 30,20,30,30,30,30,30,3
0,0170
 1155DATA 30,20,5D,5D,0B,05,19,1
3,0146
 1160DATA 20,31,2D,39,20,20,20,5
D,0174
 1165DATA 20,5D,30,30,30,30,30,3
0,019D
 1170DATA 30,20,30,30,30,30,30,3
0,0170
 1175DATA 30,20,30,30,30,30,30,3
0,0170
 1180DATA 30,20,5D,5D,30,20,14,0
F,017D
 1185DATA 20,05,18,09,14,20,20,5
D,00F7
 1190DATA 20,4A,40,40,40,40,40,4
0,01EA
 1195DATA 40,40,40,40,40,40,40,4
0,0200
 1200DATA 40,40,40,40,40,40,40,4
0,0200
 1205DATA 40,40,4B,4A,40,40,40,4
0,0215
 1210DATA 40,40,40,40,40,40,40,4
B,020B
 1215DATA 20,55,40,40,40,40,40,4
0,01F5
 1220DATA 40,40,40,40,40,40,40,4
0,0200
 1225DATA 40,40,40,40,40,40,40,4
0,0200
 1230DATA 40,40,40,40,40,40,40,4
0,0200
 1235DATA 40,40,40,40,40,40,40,4
9,0209
 1240DATA 20,5D,13,0F,15,0E,04,2
0,00E6
 1245DATA 13,01,0D,10,0C,05,12,2
0,0074
 1250DATA 02,19,20,07,01,12,19,2
0,008E
 1255DATA 06,12,19,20,01,15,07,1
5,0083
 1260DATA 13,14,20,31,39,38,36,5
D,017C
 1265DATA 20,5D,93,8F,95,8E,84,A
0,03E6
 1270DATA 93,81,8D,90,8C,85,92,A
0,0474
 1275DATA 86,8F,92,A0,99,8F,95,9
2,0496
 1280DATA A0,83,8F,8D,8D,8F,84,8
F,046E
 1285DATA 92,85,A0,B1,B9,B8,B6,5
D,04EC
 1290DATA 20,4A,40,40,40,40,40,4
0,01EA
 1295DATA 40,40,40,40,40,40,40,4
0,0200
 1300DATA 40,40,40,40,40,40,40,4
0,0200
 1305DATA 40,40,40,40,40,40,40,4
0,0200
 1310DATA 40,40,40,40,40,40,40,4
B,020B
 1315DATA 20,20,20,20,20,20,20,2
0,0100
 1365AD=1536:L=1400:RESTORE 1400
 1370CK=0:FORM=0TO7:READD$:D=DEC
(D$):POKEAD+M,D:CK=CK+D:NEXTM:RE
ADCK$
 1375IFCK<>DEC(CK$)THENPRINT"[HO
ME2]DATA ERROR AT LINE:"L:END
 1380L=L+5:AD=AD+8:IFL=1420THEN1
390
 1385GOTO1370
 1390POKE1539,DV:CHAR1,0,23,CHR$
(27)+"T"
 1395SYS1536:END
 1400DATA A9,01,A2,08,A0,01,20,B
A,02CF
 1405DATA FF,A9,04,A2,1C,A0,06,2
0,0330
 1410DATA BD,FF,A9,00,85,D8,A9,0
8,0473
 1415DATA 20,D8,FF,60,53,43,52,4
E,038D
```

Extended Basic

Paul Eves presents a Basic extension that adds 27 useful commands to the C64's extremely limited Basic.

Basic Version 2.0 as supplied on the C64 is very limiting. No instructions are provided to help you with such things as getting a directory from your disk drive, merging two programs together or even renumbering your program.

The extended Basic given away free with this month's issue of Your Commodore changes all that. A total of 27 new commands have been added that you will no doubt find invaluable in your day to day programming.

To use the program simply position the cassette in your cassette recorder and type LOAD "EXBAS" and press RETURN. Once the program has finished loading it will announce itself and it will be ready for use.

General Toolkit Commands

Toolkit or program development commands are probably the greatest missed form of instruction on the C64. How many times have you written a Basic program that the line numbers went in the order 10,12,13,17,20, etc. Wouldn't a RENUMBER command make life a lot easier, well now you've got one as well as many more of this type of command.

Should you want to renumber your programs then you can now use the RENUM command this has the following format:

RENUMx,y,z

Where x is the line number where the renumber should start. If x is 0 then the whole program is renumbered. y is the new increment for the lines. If y was 10 then the lines would step up in tens, if it was 15 then the line numbers would be 15 apart.

z is the new start line. This is the line number that the first line to be renumbered should be replaced with.

For example: RENUMO,3,5 will renumber the whole of the program with an increment of 3 and a start line number of 5.

The AUTO command will automatically generate line numbers for you. Enter the command AUTO 10,10 and you will be prompted with the line number 10. Finish typing in that line press RETURN and line 20 pops up as if by magic. If you would rather have your program starting at line 100 and going up in steps of 20 then you would simply enter the command AUTO 100,20. When you want to quit this command simply press RETURN on a line with just the number and no text on it.

Once you have finished writing you latest Basic masterpiece there are bound to be program lines that are no longer needed. That's an easy one you say, simply type the number of the line that you want to delete and it will be erased. That's OK, but what if you wanted to delete 20, 30 or even 100 lines? This would obviously take quite a while if you were to enter each of the numbers individually. Well the DEL command comes to your rescue. This command allows a block of program to be deleted. The command 'DEL number, would delete all lines from 'number' onwards. For example, 'DEL 1000, would delete all lines from 1000 onwards. If you wanted to erase a block of code in the middle of the program you would use the command in the form 'DEL number 1,number 2'. This will delete all lines from line number 'number 1' to line number 'number 2'.

When you come to testing a program it is often useful to see exactly what variables have been set up and what their values are. This is extremely useful if your program has crashed with an error and you are trying to find out why. The command DUMP will print out the name and value of all variables that have been set up by the program. NOTE: the program must have been RUN first or the variables will not have been set up.

The function keys on the C64 have always been a little bit of a mysterious beast. Unlike those on the BBC and other computers you can't actually program them. Well now you can with the KEY command. This command is extremely powerful as it allows you to store, in each of the function keys, a text string. For example you may want the key F1 to cause your program to be renumbered. Well you can now store the Extended Basic word 'RENUM' in this key. The command can take two forms:

KEY by itself will print out a list of all of the function keys and the text that is stored with them.

KEY number, "text" will assign a given string to the numbered key.

If you wish to use a space in your text you must enter it as a shifted space, i.e. pres shift and the spacebar. RETURNS can be entered by placing the back arrow at the end of your text.

For example let's assume that you wanted to put the keyword list on key 4 and you wanted a RETURN at the end so that the command was executed, you would use the following command:

KEY4, "LIST←"

NOTE: any of the above commands will enable the function keys if you have turned them off.

Should you wish to turn off the function keys then you should simply enter the command OFF.

When typing in your program it is always useful to know how much

memory you have left. MEM will display the amount of Basic memory available at any time.

After spending much time at the keyboard there is nothing more frustrating to find that you typed the NEW command and wiped out your program without SAVEing it first. Don't worry the program is still in memory and the OLD command will bring it back for you.

When you come to checking your programs there are two commands that are invaluable. The first of these is the LIST command. Yes there is one on the C64, but have you tried to read a listing as it zips off the top of the screen? Well LIST can be modified so that pressing the SHIFT key will pause the list. NOTE pressing down SHIFT LOCK will pause the listing until it is released. To initiate this modification you simply enter the PAUSEA command.

The second useful command is the TRACE function. This command allows you to slowly step through a program one line at a time, the line number being operated on being displayed on the screen. The TRACE command takes the following format:

TRACE

You must press the space bar to activate the next line, while in trace model. Hitting a numeric key will alter the speed of the trace.

When you have finished with your trace you must turn it off with the TROFF command.

Using a Drive

If you own a Commodore disk drive you will no doubt find it extremely annoying that you can't look at a directory of a disk without LOADING it into memory and overwriting the program that is there. Well now you can use the DIR command which will display the directory of the disk on the screen without destroying the program. The syntax for this command is:

DIRx

where x is either 0 or 1. The 0 and 1 represent the drive numbers. A number must always be present, if you have a single drive then you must use DIRO.

If you should ever have a disk drive error you can read the error channel with the DERR command. This will display on screen the current disk drive status.

Sending commands to the disk drive has also been made a lot easier with the DISK command. This command takes the form:

DISK "command:string, string,etc"

where command is one of the disk commands and the strings are as associated with the command. For example: DISK "S:PROG1,PROG2" will delete the two programs from the disk.

DISK "V" will perform a validate command.

Playing With Numbers

When developing a program it is quite useful to be able to transfer numbers from one base to another. This Basic provides commands for Binary and Hexedecimal conversion.

B-D number

This command converts an eight bit binary number into two decimal numbers, shown as low byte/high byte. Any number of conversions can be catered for, providing that each set of digits are separated by a comma. For example the command:

B-D 11001100,10101010

would give the following results:

204/52224, 170/43520

NOTE: the syntax is the same for all conversions.

D-B number

Conversion between decimal and binary is possible with this command. The decimal number must be in the range 0 to 65535. The binary equivalent is printed as a 16 bit binary number. For example:

D-B 32768

prints the result:

10000000 00000000

D-H Number

Conversion from decimal to hex is possible with this command. The decimal number must be in the same range as the above command.

The H-D command has the opposite effect to the above command and will change a hexadecimcal number to decimal. NOTE do not use a $ before the hexadecimal number.

Program Manipulation

If you do a lot of programming it is very handy to have a large number of commonly used subroutines stored on disk or cassette. For example you may have a collection of special input routines, routines to read the joystick port, etc. On a standard C64 the only way to get these programs on to the end of a program was to type them in again. Two new commands will save you from this trouble, these are APP and MERGE.

Let's say that you have a program on disk that has the form

```
15 PRINT "THERE"
25 PRINT "THERE"
```

and you had a program in memory that looked like this:

```
10 PRINT "HELLO"
20 PRINT "HELLO"
```

You can stick the program that is on disk on to the end of the one in memory with the APP (append) command. The format for this command is quite simply:

APP "progname",device.

If your program on disk was called "test" then you would enter the command:

APP "test",8

this would leave the program in memory looking like this:

```
10 PRINT "HELLO"
20 PRINT "HELLO"
15 PRINT "THERE"
25 PRINT "THERE"
```

As you can see it will be necessary to use the renumber command to get the program lines in the correct numerical order.

The APP command simply adds one program on to the end of the other. The MERGE command is a little more powerful as it will stick together the two programs in such a way as the new program lines are added to the old program in their correct position. NOTE: if the two programs have the

same line numbers then the new program lines will overwrite the old.

If we look at our previous example and give the command:

MERGE "test",8

then you will get the following result

10 PRINT "HELLO"
15 PRINT "THERE"
20 PRINT "HELLO"
25 PRINT "THERE"

no doubt you can see the difference.

Playing With Memory

Quite often when writing programs it is necessary to save a block of memory to tape or disk. The C64 has no commands available to do this so you must result to POKEing memory. This gets a little Messy and confusing. The MLOAD,MSAVE and MVERIFY commands will rectify this.

MLOAD takes the following format:

MLOAD "program",dev,1,sa

and allows you to LOAD a program into any area of memory. 'dev' is the number of the device that you want to LOAD from and 'sa' is the address where you want the LOAD to start from.

MSAVE allows you to SAVE a section of memory to the specified device it has the form:

MSAVE "name", dev,1,sa,fa+1

where 'sa' is the start address for the SAVE and 'fa' is the end address. DON'T forget to add one on to this.

If you should ever use machine code then it is quite useful to be able to set where in memory you want your Basic program to start. It is also useful to be able to set the top limit for your program as well. These functions can both be performed by POKEs, however the HI and LO commands make this much easier.

HI address

will set the Top of memory to 'address' and

LO address

will set the bottom of memory to 'address'.

Program Readability

Commodore programs are not exactly well known for their legibility, as you are no doubt aware they have lots of graphics symbols in them for things like clearing the screen etc. The CODE command will turn any graphics symbols into mnemonics that represent the code that is being used. For example a graphic hart which is found by pressing shift S would be represented by [G>S] which means graphic (G) shift (>) and S.

To use the command you must have the program to be changed in memory and then enter the command CODE.

NOTE: once this command has been issued you will not be able to use the program again, except for listings, etc, so make sure that you have saved a copy of the program onto disk or cassette.

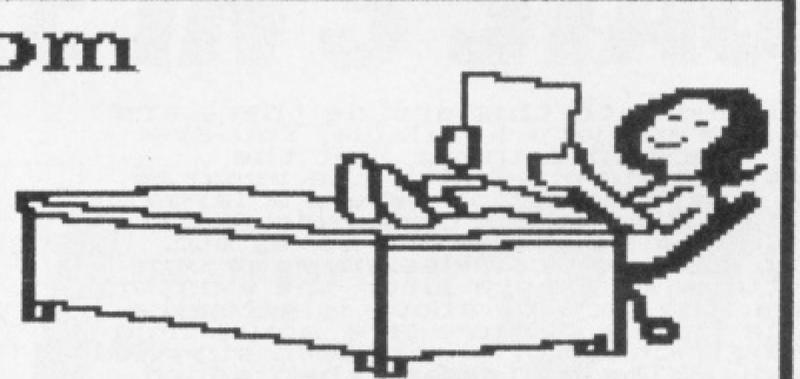
Leaving Extended Basic

Provision has been made in case you should ever want to quit from the Basic and return to standard C64 Basic. Simply type the word QUIT and everything will be back to normal. YC

The Newsroom

Design your own newspapers with this package from Ariolasoft.

By Stuart Cooke.



Writing and publishing your own newspaper is something that many pe ople will have tried. Their first entry into the world of journalism may have been a school magazine, a paper for their club or even the local church magazine. There's no doubting it there's a little bit of the 'Rupert Murdoch's' in all of us.

The newsroom, one of the latest releases from Ariolasoft, brings the world of electronic publishing to your C64 computer.

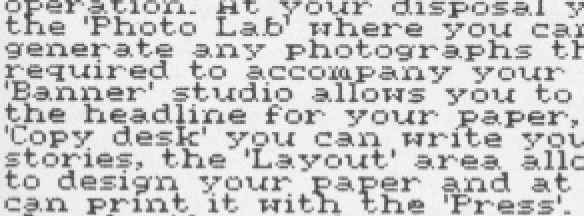
Basically the program turns your computer into a complete printing operation. At your disposal you have the 'Photo Lab' where you can generate any photographs that are required to accompany your text. The 'Banner' studio allows you to design the headline for your paper, at the 'Copy desk' you can write your stories, the 'Layout' area allows you to design your paper and at last you can print it with the 'Press'.

One further and extremely interesting feature is the 'Wire Service'. This allows you to use your computer together with a modem to swap stories with other people, down the phone line. Unfortunately this option uses the Commodores built in RS232 interface so is unsuitable for use with the Commodore Modem sold over here for use with Compunet. However, if you do have access to an RS232 modem you could no doubt have great fun swapping stories with friends. Unfortunately due to the fact that I didn't have a modem available this couldn't be tested.

Using the program

Newsroom is extremely easy to use as it is mainly menu driven. You can use joystick, Koalapad or the keyboard to select information, though obviously the keyboard must be used for entering text.

The first screen upon loading is a shot of the whole 'factory'. Selecting the option that you require is simply a matter of high-lighting the correct area and commencing work. When entering text the C64



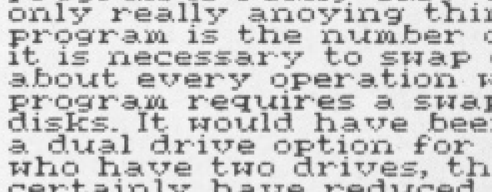
performs all the formatting of the text. This means that you don't have to worry about where your text breaks at the ends of lines, or layout around pictures. However, as the text around the previous picture shows the breaks may not be exactly where you want them.

As previously stated all operations within the program are selected from menus. These take the form of a number of icons, or pictures, down the side of your square work area. The pencil for example will bring up the drawing functions, the camara takes a photograph etc. in fact the program is really easy to use. The only really anoying thing about the program is the number of times that it is necessary to swap disks, just about every operation within the program requires a swap of the disks. It would have been nice to see a dual drive option for those people who have two drives, this would certainly have reduced the amount of swapping required.

I have already stated that your work area is a square upon the screen. This may seem a little strange when you think of how a paper looks but it does make sense once you understand how you lay the paper out. The newspaper is made up of a number of panels, the squares, all stuck together. This page is actually made up of two columns of three panels plus a banner across the top. As I said once you understand how the structure of the paper works it is extremely easy to follow. You don't have to make your stories etc. fit over exactly one panel. In fact This line is the start of a new panel.

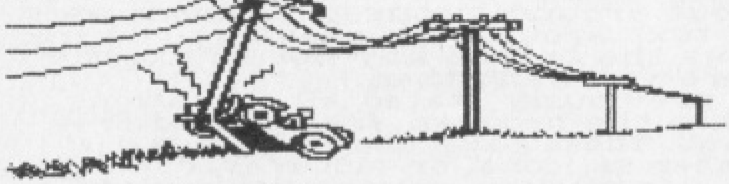
Taking a Photo

Perhaps calling the pictures that are included with your text 'photographs' is a little bit of a cheat, since they are actually drawings. Over 600 pieces of art are included with the program on a double sided disk.



Thankfully the back of the manual shows you every piece of art available. As can be seen from the pictures

included with this article there are quite a variety available. You are not stuck with using just the pictures supplied with the program, the graphics option offers a large range of graphics commands including various fills, boxes etc. With this you can design your own pictures or simply alter the existing ones. The picture above is actually made from a picture of a mouse hole and a picture of a cat, both supplied on disk. The walls were then added using the graphics option. Obviously within this review the pictures are only there to illustrate what the program can do. When writing your own newspaper the pictures should of course complement the story that you are writing. For example the following picture could be used to illustrate a story about a road accident.

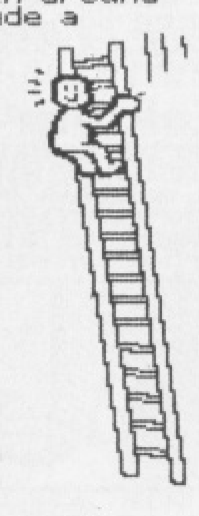


In fact the pictures, or photos, are only limited by your imagination and artistic ability. If like me your artistic ability extends as far as extremely badly drawn matchstick men then I'm sure that the 600 plus pieces of art included with the package will come in very handy.

The Copy Desk

This is where you actually sit down and write your text. Within each of the panels you can use two type faces. Available for use are small and large serif, small and large sans serif and large english. So far all text within this review has been produced with the Serif face. The headline and text in this panel is in the Sans Serif face. The difference between the two is fairly obvious. If you are interested this magazine is printed in a serif face. The final face, English, is only available in large size and is thus suitable mainly for headlines. The next subhead uses this face so that you can see what it looks like.

As I have said the program handles all of the formatting of the text, even around pictures. If you do want to include a picture in a panel it is a good idea to load it in before you start writing so that you can position it where you require it. This means that you can see exactly how much room is left for text. As this picture demonsrates the program actually acts as though there is a square around the picture. You actually crop this square yourself in the photo option. This means that even though there may be a lot of white space around the picture the program will not let you use it. This doesn't matter too much if you are careful about where you place your picture and how you crop it. Careless design can lead to wasted space.



Designing a head

The Banner option allows you to design the masthead, or title, that is to go at the top of your paper. As with the copy option pictures can be included here as well as text. The main differences between this and the copy option is that the Masthead is obviously a lot wider and you don't have to take a photo of artwork being used. All artwork can be either designed yourself with a graphics option, the same as with photos, and artwork can be chosen from the range available on the clip-art disk. The design of your masthead is therefore totally at your control. For the head of this piece I simply chose a piece that suits most peoples ideas of a journalist.

Laying it all out

Design of your newspaper is obviously extremely important. After all if people don't like the way your paper looks they probably will not read it. The Layout option is where you actually place all of the panels that you have designed in some sort of order. The structure of your actual paper can take one of four formats:

- 8 1/2 * 11 inches with banner.
- 8 1/2 * 11 inches without banner.
- 8 1/2 * 14 inches with banner.
- 8 1/2 * 14 inches without banner.

In producing this review I have used both of the first two options. The first page made up of a banner plus three panels. The second is made up of four panels per column.
The actual positioning of your stories is important since you need to give the reader the best possible effect.

Printing Press

Printing your paper should pose no problems. Numerous printers and interfaces are catered for including the whole Epson range. This is probably the first package that I have used that has an option for my Prowriter printer, usually I have to go through an expensive interface. It is worth pointing out that the interfaces catered for are American, so this may cause a few problems. It is worth noting that the Cardco interface is available from Ariolasoft.

Within the printing press you have the facility to print out pictures, panels, banners and complete pages. This review, done completely with newsroom, gives some idea of what the output looks like.

Final thoughts

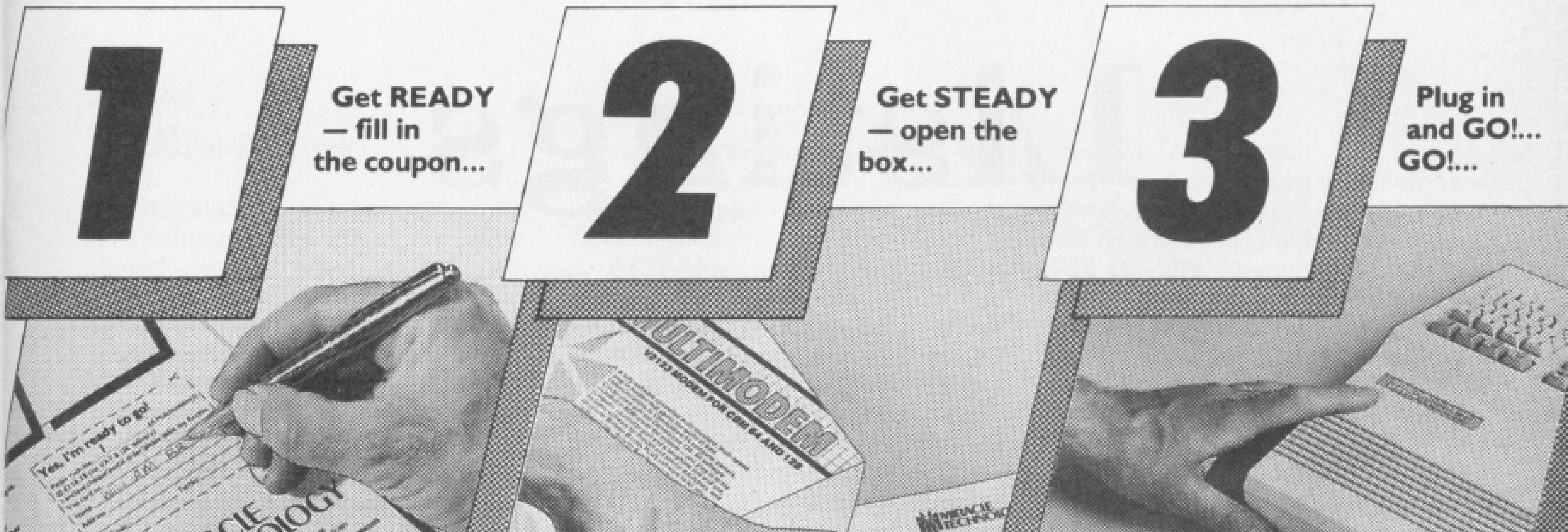


I don't think that I have ever had so much fun writing a review as I did with this one. If you own or have access to a printer then this program is a must.

Touchline

Program:The Newsroom. Machine:C64.
Price:39.99. Supplier: Ariolasoft

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Listings

Get it right first time with our deluxe program system for the C64.

You may have noticed that our listings are free of those horrible little black blobs which send you searching around the keyboard for a suitable graphic symbol. You may also have noticed the funny numbers by the side of each line of the listing. Fret no more, it's all part of our easy entry aid.

Instead of those nasty graphics and rows of countless spaces in PRINT statements and strings we use a special coding system. The code, or mnemonic, is always contained in square brackets and you'll soon learn to decipher their meanings.

For example, [SA] would mean type in a Shifted A, or an ace of spades in layman's terms, and [SA10] would mean a row of ten of these symbols.

[S+2] means hold down the shift key and press the plus key twice. It doesn't take a great leap of logic to realise that [C+2] means exactly the same thing except that the Commodore key (bottom left of the keyboard) is held down instead of the shift key.

If more than two spaces appear in a statement then this will be printed as [SPC4] or, exceptionally, [SSPC4]. Translated into English this means press the spacebar four times or in the latter case hold the shift key down while you do it.

A string of special characters could appear as:

[CTRL N, DOWN2,LEFT5,BLUE, F3,C3]

This would be achieved by holding down the CTRL key as you press N, press the cursor key down twice, the cursor left key five times, press the key marked BLUE while holding down the CTRL key, press the F3 key and, finally hold the Commodore key down while pressing the number two key (C2 would of course make the computer print in brown).

Always remember that you should only have a row of graphics characters on your screen with no square brackets and no commas, unless something like this appears:

[SS],[C*]

In this case the two characters should have a comma between them.

On rare occasions [REV T] will appear in a listing. This is a delete symbol and is created by entering the line up to this mnemonic. Then type a closing quotation mark (SHIFT & 2) and delete it. This gets the computer out of quotes mode. Hold down CTRL and press the number nine key (RVSON), type the relevant number of reversed T's and then hold down CTRL and press zero (RVSOFF). Next type another quotation mark and delete it again. Now finish the line and press RETURN.

A list of these special cases is given in the table but remember that only one of these mnemonics will appear outside of a PRINT string: the symbol for pi. This may appear when its value is needed in a calculation so this may look something like:

:CC=2*[PI]*R:

Ignore the square brackets and just type in a shifted upward pointing arrow (ie. the pi symbol).

PROGRAM: SYNTAX CHECKER

```
5 REM * YOUR COMMODORE SYNTAX CH
ECKER *
10 BL=10    :LN=50    :SA=49152
20 FOR L=0 TO BL:CX=0:FOR D=0 TO
 15:READ A:CX=CX+A:POKE SA+L*16+
D,A:NEXT D
30 READ A:IF A><CX THENPRINT"ERR
OR IN LINE";LN+(L*10):STOP
40 NEXT L:SYS 49152
50 DATA 173,5.3,201,165,208,31,1
20,169,9,141,32,208,141,33,208,1
847
60 DATA 169,7,141,134,2,169,13,3
2,210,255,169,64,141,4,3,169,168
2
70 DATA 192,141,5,3,88,96,120,16
9,124,141,4,3,169,165,141,5,1566
80 DATA 3,169,14,141,134,2,141,3
2,208,169,6,141,33,208,88,96,158
5
90 DATA 32,124,165.72,138,72,152
,72,162,0,165,20,133,254,165,21,
1747
100 DATA 24,101,254,133,254,189,
0,2,240,18,69,254,133,254,232,18
9,2346
110 DATA 0,2,240,8,24,101,254,13
3,254,232,208,233,169,1,141,134,
2134
120 DATA 2,164,214,132,253,136,1
36,165,254.74,74,74,74,32,161,19
2,2137
130 DATA 32,210,255,165,254,41,1
5,32,161,192,32,210,255,169,13,3
2,2068
140 DATA 210,255,169,7,141,134,2
,164,253,132,214,104,168,104,170
,104,2331
150 DATA 96,24,105,48,201,58,16,
1,96,24,105,7,0,0,0,0,781
```

by Eric Doyle

Checksum Program

The hexadecimal numbers appearing in a column to the left of the listing should not be typed in with the program. These are merely checksum values and are there to help you get each line right. Don't worry if you don't understand the hexadecimal system, as long as you can compare two characters on the screen with the corresponding two characters in the magazine you can use our line checking program.

Type in the Checksum Program, make sure that you've not made any mistakes and save it to tape or disk immediately because it will be used with most of the present and future listings appearing in Your Commodore.

At the start of each programming session, load Checksum and run it. The screen will turn brown with yellow characters and each time you type in a line and press the RETURN key a number will appear on the screen in white. This should be the same as the corresponding value in the magazine.

If the two values don't relate to one another, you have not copied the line exactly as printed so go back and check each character carefully. When you find the error simply correct it and press RETURN again.

If you want to turn off the checker simply type SYS49152 and the screen will return to the familiar blue colours. You can then do whatever it was you wanted to do and if this doesn't use the area where Checksum lies you can go back to it with the same SYS command.

No system is foolproof but the chances of two errors cancelling one another out are so remote that we believe our listings are more reliable than any other magazine in the world. So get typing! YC

Mnemonic	Symbol	Keypress
[RIGHT]		CRSR left/right
[LEFT]		SHIFT & CRSR left/right
[DOWN]		CRSR up/down
[UP]		SHIFT & CRSR up/down
[F1]		f1 key
[F2]		SHIFT & f1 key
[F3]		f3 key
[F4]		SHIFT & f3 key
[F5]		f5 key
[F6]		SHIFT & f5 key
[F7]		f7 key
[F8]		SHIFT & f7 key
[HOME]		CLR/HOME
[CLR]		SHIFT & CLR/HOME
[RVSON]		CTRL & 9
[RVSOFF]		CTRL & 0

Mnemonic	Symbol	Keypress
[BLACK]		CTRL & 1
[WHITE]		CTRL & 2
[RED]		CTRL & 3
[CYAN]		CTRL & 4
[PURPLE]		CTRL & 5
[GREEN]		CTRL & 6
[BLUE]		CTRL & 7
[YELLOW]		CTRL & 8
[POUND]		£
[LARROW]		←
[UPARROW]		↑
[PI]		SHIFT & ↑
[INST]		SHIFT & INST/DEL
[REV T]		see text
[Cletter]		CBM + letter
[Sletter]		SHIFT + letter

Software for sale

If you think that one of our programs looks very interesting, but you can't afford the time to type it in then our software service will help you out.

It's three o'clock in the morning. You sit at the computer keyboard just finished a marathon typing session entering one of the superb programs from *Your Commodore*. Your fingers reach for the keyboard and press the letters R, U and N. You press RETURN, sit back and nothing happens.

Everyone has probably faced this problem. When it does happen it's a matter of spending hours searching through the program for any typing mistakes. No matter how lo ng you look or how many people help you, you can usually guarantee that at least one little bug slips through unnoticed.

The *Your Commodore* Software Service makes available all of the programs from each issue on both cassette and disk at a price of £6.00 for disk and £4.00 for cassette. None of the documentation for the programs is supplied with the software since it is all available in the relevant magazine. Should you not have the magazine then back issues are available from the following address:

INFONET LTD, Times House, 179 The Marlowes, Hemel Hempstead, Herts. HP1 1BB.
TEL: (0442) 48435

please contact this address for prices and availability.

The Cassette

All programs on the cassette are saved using a turbo program. If you have ever purchased software from us on cassette before it is worth pointing out that as of this issue cassette the turbo used has been altered. On all cassettes for previous issues the programs are unprotected and appear in the same format as they do in the magazine i.e. in the form of Basic loaders. The new turbo being used from this issue onwards allows us to produce fully working versions of the program on cassette. This means that you will simply have to LOAD the programs in and they will automatically start. Should we put any programs for the C128 on the cassette they will be stored as C64 programs. LOAD these programs into the computer in C64 format and resave them to cassette or disk. To use the program turn your computer into C128 mode and LOAD and RUN as normal.

The Disk

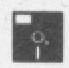
Programs on the disk will also be supplied as totally working versions, i.e. when possible we will not use Basic Loaders thus making use of the programs much easier. Unfortunately at the moment we cannot duplicate C16 and Plus/4 cassettes. However programs for these machines will be available on the disk.

What programs are available?

At the top of each article you will find a strap containing the article type, C64 Program etc. So that you can see which programs are available on which format you will also find a couple of symbols after this strap. The symbols have the following meaning:



This symbol means that the program is available on cassette.



These programs are available on disk.

Please Note

Since the programs supplied on cassette are total working versions of the program, we do not put disk only programs on tape. There is no sense in placing a program that expects to be reading from disk on to tape.

YC

UTILITY SPECIAL

This contains a few of our most popular utilities from earlier issues of the magazine. The programs are:

MACH 2 our disk based assembler from Nov '85 to Feb '86.

STOP THIEF — add protection to your programs with this utility from our Feb '86 issue.

IN CHARACTER — an excellent character editor from November 1985.

MOB MAKER — to complement the character editor, a sprite editor from the March 1985 issue.

DISK EDITOR — an extremely powerful utility for disk drive owners allowing you to directly access and alter every segment of your disk.

Should you not have any of the above issues and would like instructions then a full set of photocopies is available for £1.50. Please order this separately from: *Your Commodore*, Utility Special Photocopies, No 1 Golden Square, London W1R 3AB. Cheques or Postal orders to be made payable to A.S.P. Ltd.

ORDER CODE
DISK — YDMA862 £6.00
TAPE — YCMA862 £4.00

MARCH 1986

KUNG FU — All the fun of the orient with this entry to our programmer of the year competition.
DATA MAKER — Machine code to Basic made easy with this utility - DISK ONLY (C64).
HYPA BASIC — An extended Basic with a powerful built-in machine code assembler (C64).
SCROLLING — A superb routine to scroll your screen with ease in a horizontal direction. A must for games programmers (C64).
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GRID SEARCH — Can you find the hidden mines in this excellent game (C64)?

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APRIL 1986

TELEPHONE EXCHANGE — Our excellent teletype communications program for use with a C64 and RS232 modem.
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DATA BOS — Keep track of your information with this database program for the C128.
BASIC TEST SYSTEM — A usefulo utility for debugging programs. Commands include TRACE, SINGLE STEP and the ability to set break points (C64).
TOPMON — A superb machine code monitor with 19 commands including Decimal to Hex conversion, disk access, memory disassembly etc. (C64).
2 FOR THE 128 — Set up autoboot files on your C128 disk drive. Plus, a program that will autoboot a program in C64 mode (128).

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MAY 1986

ADVENTURE AID — A set of routines to help you write your adventures. Includes facilities for setting up location descriptions, vocabulary etc. (C64).
TELEPHONE EXCHANGE — (See April 1986).
3D ROUTINES — Routines to allow you to produce effects similar to those found in the famous 3D maze type game (C64).
WORDPROK — A powerful disk based wordprocessor for use with the C64. Includes commands for line spacing, setting margins performing word counts etc.
POLAR PETE — Can you help Pete build his igloo in this game for the C64?

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JUNE 1986

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JULY 1986

DISKBASE 128 — Keep track of your disks with this utility for the C128.
DETAILED DIRS — Gives useful information about your disks including track and sector at which programs are stored, start address of program and address etc. (C64).
DIAL A FILE — Files downloaded with our TELEPHONE EXCHANGE program can now be edited with this extension for the C64.
ASSEMBLER 128 — A full blown assembler for use with your C128 and tape or disk.
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AUGUST 1986

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DIMON 128 — Disk utility program for the C128. Includes commands for editing tracks and sectors of the disk, protecting programs, write protect disk etc.

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SEPTEMBER 1986

BACKDROPS — Sample backgrounds and sprites for use with the 3IN1 EDITOR published in August 1986.
ASSEMBLER 128 — Full C128 assembler. Same as JULY'86 issue.
ICON DRIVER — A small routine that allows you to move a sprite around the screen with a joystick. Useful if you want to develop an icon program (C64).
RECONFIGURE — Develop routines to alter the memory configuration of your C64 with ease.
CROSSWORD — Put your brain to work with this superb crossword program. Includes four crosswords for you to try (C64).
ALL CLEAR — Some interesting ways to clear the screen with this collection of routines (C64).
ADVENTURE GRAPHICS — Add graphics capability to our ADVENTURE AID program published in the May 1986 edition of Your Commodore (C64).

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OCTOBER 1986

CROSSWORD — See September issue.
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Videobasic 64

Evelyn Mills has been testing out a new product from Adamsoft.

First, a word about *Ultrabasic*, the forerunner of the current release *Videobasic 64*. The former has been around for quite some time - three years in fact - and, to quote Keith Bowden in *The Companion to the Commodore 64*; "it is the best software library available for the Commodore 64".

As a consistent user of *Ultrabasic*, I heartily endorse his comments. Hi-res graphics, circling, blocking, filling etc. are well covered in this software, plus easily handled sprites, sound and, most important of all, the very versatile Turtle Graphics which work via direct command at an exceedingly fast rate. All this is fully compatible with Basic, printer output etc.

The new release *Videobasic 64* is an extremely powerful software package for graphics and sound. Very few of the *Ultrabasic* commands have been altered, but so much more has been added. Any programs which you may already have written in *Ultrabasic* can readily be incorporated into the *Videobasic* package for alteration and extension.

Graphics

The VB screen corresponds to normal graphic conventions with the X axis going from left to right and the Y axis from bottom to top. You may work in HIRES or MULTI modes and the commands include draw, dot, box, block, circle, char (for type) and fill. When the circling command is used the x or y factors may be modified to squeeze the circle in either direction to give ellipses. Text to screen is available in four different sizes.

The fill command can be used in normal standard colour or in an extended format to produce pattern filling - you design your own pattern in a very simple manner, add the data to the fill command and get results in a flash. Most commendable. Should you make a mistake in the filling location, the stop key will do just that.

To facilitate copying portions of a graphic screen, a region command is included, copying areas of the screen from one area to another; among other features of this command reverse copying is possible.

Sprites

No problem here; sprites may be handled in Data form; Hex or bit-mapped on screen. Fifteen possible sprites may be used with 15 different slots. Using standard commands, sprites may be placed and moved around at will, expanded, rotated and turned on or off. Once defined, they can be recalled easily from memory.

Turtle Graphics

VB's turtle graphics are very powerful and respond to direct command such as move, turn, turn to etc. Using the 'bye' command makes the turtle disappear and graphics run at a very fast rate. Bracketing commands allows repetition of moves and there is a lot in this section alone. All commands may be interlinked to the graphics mode, so there is even more scope here.

Music

This is fully documented and music may be entered in two ways to allow simple 'sounds' (explosions, sirens etc.) or, more commendable, very pleasant single voice music of high quality. This can be used as a Raster interrupt to play along with your programs.

All this is fully interlinked to Basic and there are SCREEN DUMP facilities to tape or disk, restoration of graphic display. HARDCOPY to Commodore, Epson, Gemini or Okidata printers in either small size or full size screen.

Advanced Features

One outstanding feature of VB is to set up two graphics screens at once. Blocks of memory are transferred from one screen to another with two 'XFER' commands which are simple to handle; reverse swapping is included and the effects are quite spectacular. A little care must be taken here to avoid crashing the program. Just follow the instructions!

Sprites, graphics, copy handling, pattern designing and filling are all possible with the screen swaps and 'flashing effects' can be produced. If I went into this fully, I'd fill the whole magazine. Suffice to say that all commands are adequately documented.

The Manual and Tutorials

The manual is well presented and fully documented. Included on the disk are a Demo and three tutorials. For those of you who already have Ultrabasic, the demo is disappointing; this, however, is adequately compensated for in the tutorials which may be printed out in the normal 'list' manner. These are really comprehensive, particularly with reference to the more advanced feature of VB.

Well, if you feel like a change from icon-joystick-lightpen graphics, have a go at VB. You won't be disappointed (although if you are really attached to your peripherals you may use joystick and lightpen programs in VB, while collision between sprites and between a sprite and background pattern can be detected).

In your distribution, 'run-time' version of VB (royalty free - stand alone), the user cannot LIST, SAVE or MODIFY your program.

This is an excellent, well designed program. It may seem expensive, but you get a lot for your money, particularly as Abacus Software is American and the current exchange rate is hardly designed for the British consumer. Have a go! YC

Touchline
Adamsoft: 18 Norwich Ave, Rochdale, Lancs 0N11 5JZ. 0706 524304. *Price*: £24.95.

commodore

128

At last there's a proper 128 programmer's toolkit, it's called Hack-Pack, and has a Ram-disk facility too! (details below). Our 24-hour recorded order service is open now, so outside office hours, or if our sales line is busy, just call 01-541-5185. Remember, we're only a phone call away!

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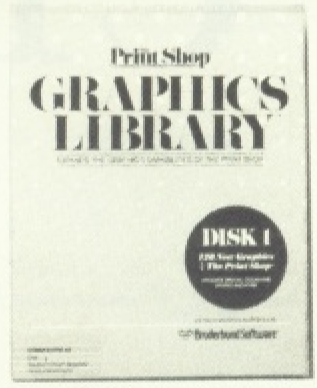
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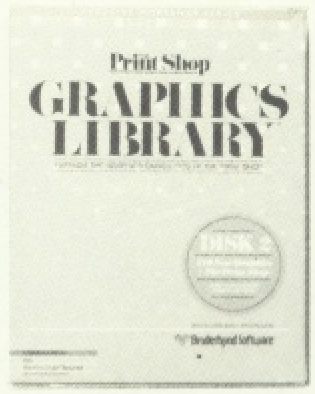


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Study the pictures on this page. There are several differences between them. Mark the differences on the picture attached to the coupon, fill in your name and address pop it in an envelope and send it to us. Mark the number of differences very clearly on the back of your envelope, if you don't then your entry will be void.

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Entries will not be accepted from employees of Argus Specialist Publications and Melbourne House. This restriction also applies to employee's families and agents of the companies.

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Melbourne House Competition Entry Form





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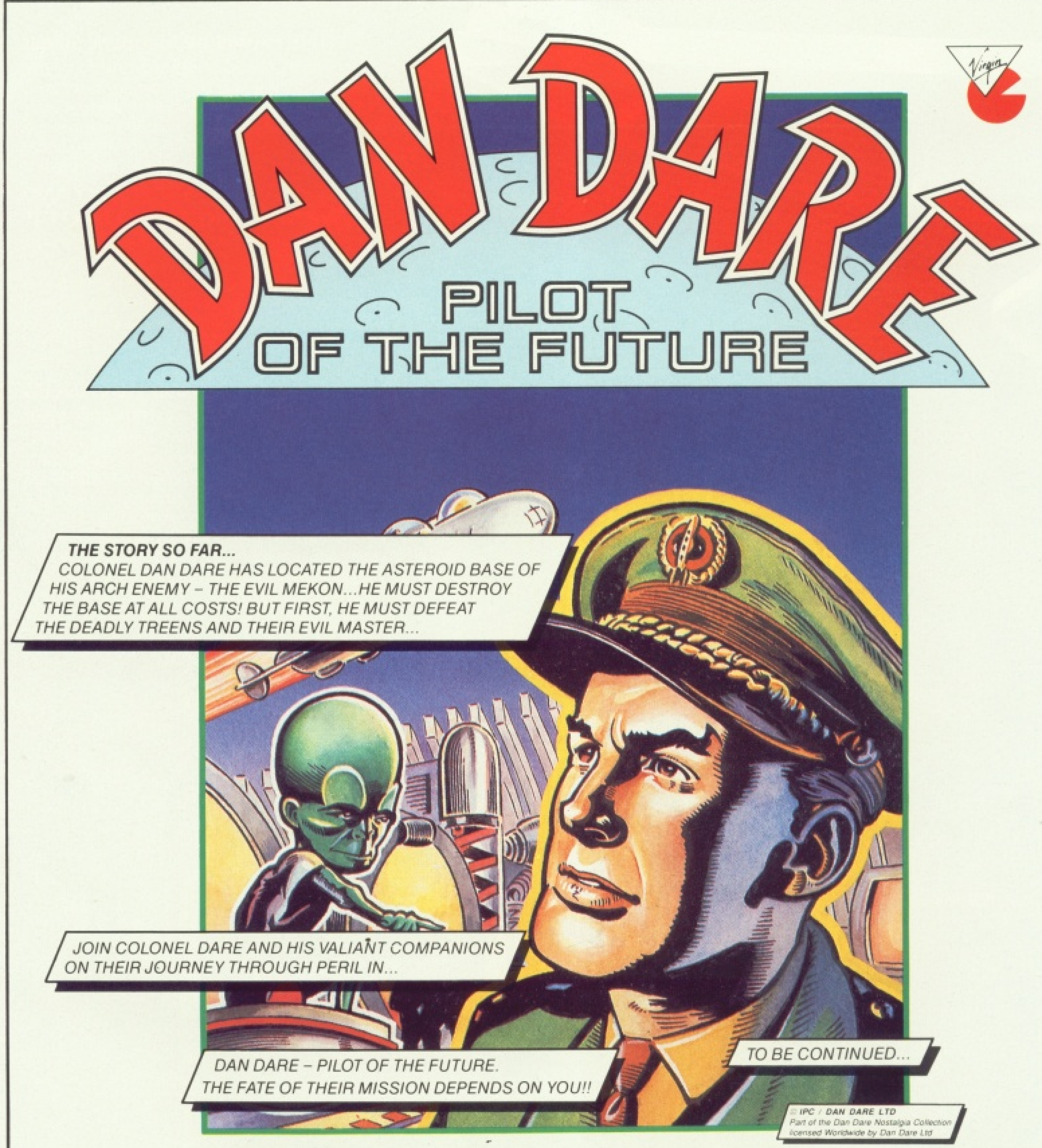
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Club 128

Your Commodore and Compunet keep 128 owners in touch with each other and with what's going on on line.

By Neil Day

Wandering around in Compunet can be like a stroll through a well laid-out garden. You are enticed from place to place by the ever-changing vistas! However, for a user in a hurry, for example on a quest for a specific piece of information, the tree-like structure can become tangle of brambles constantly catching you up in irrelevant frames or, even more infuriating, leading you back over well-trodden paths and displaying frame you have already seen three times over!

For instance, if you GOTO ICPUG in search of a bit of hazily-remembered software, you would be lucky to find it by explosing the directories. There is, for example, and excellent little utility called ISOLATOR (194624) which lets you cut and paste sections in and out of Basic programs. You might be tempted to look for it in the directory labelled "SOFTWARE" on the opening list of ICPUG frames.

This is well worth an examination incidentally, but you won't find the ISOLATOR program there. To find it by trial and error, you would have to look at the following directories in turn:
GENERAL INFORMATION, TECHNICAL TIPS, C64, SOFTWARE, and SHORTS64: your chance of hitting that particular sequence is about the same as the proverbial combination of monkeys, typewriters and the works of Shakespeare.

There is, however, an easier way. Editors of sections such as ICPUG and ICC put a lot of time into making information accessible. Both these areas have indexes; in the case of ICPUG the frame labelled CONTENTS gives you a fair idea of what the item is about, as well as its location.

GOTO INDEX gets you to a directory frame of indexes for a wide range of topics. The most general of these indexes is the "HIGHLIGHTS INDEX": an 11 page summary of the main topics covered on Compunet, with the frame number or word you need to type after selecting GOTO on the duckshoot menu. You'll probably be referring to this index so frequently, that a printed copy is a must.

One potential trap with these very helpful lists is due to the rapidity with which things change on Compunet. Be prepared for occasional "RECORD DOES NOT EXIST" messages. These frames may have expired, or the number may have been changed to a more easily remembered word. A recent news item about Alphabetic GOTOs, as these are called, suggested that you type in a few guesses: having tried this new form of combined cryptic crossword and mind-reading exercise I warn you it is not easy!



An excellent source of information about recently uploaded material will be found in the GOTOS directory. Select GOTO on the duckshoot the type "GOTOS". People who actually want their uploads read are taking advantage of this innovation by uploading a short notice in the GOTOS directory telling users that their offering is available.

Another way to find out about recent additions to Compunet is to read the excellent "newsletters" that give a review of what is available. "The Jungle Now" or "Wino's Jungle" will provide, in a few pages, enough suggestions to set you off happily exploring. Wino (GE81) seems to spend a lot of time looking out for esoteric uploads in the Jungle and his recommendations are always worth checking. GOTO NEWS will find you these "newsletter" frames. GOTO COMMS and read the Comms news pages. These get updated about once a week by GE81 and are a similar source of interesting recent uploads.

With a little perseverance the initial hassles of finding your way around fade: but remember often it is exciting just to explore the huge amount of information at random. When you find something particularly good or bad, remember that the uploader has put a delicate ego on the chopping block hoping to have it stroked: a vote of 9 can work wonders! But even a swift kick is preferable to being ignored!!

CRJT85 has come up with a very novel use for the interactive side of Compunet. Under the "News Update" directory in the YOUR128 area you'll find some Opinion Polls (172255). You show your opinion on a range of proposals by voting: Compunet's version is popular democracy at work. The idea has met with a mixed reception: one 'netter mailboxed CRJT82 saying "Club 128 is about computers not politics, there's no place for politics here"... looks like we'll just have to stick to sex and religion. The opinion poll questions for rating computer magazines seem to have drawn more votes, and less disapproval: relax Mr Editor, *Your Commodore* had straight nines the last time I looked!

While on the topic of Computer magazines, be sure to look into the *Your Commodore* directory (GOTO YRCBM) for some very welcome additions: more programs listings from the magazine are being uploaded. YC


JOHNNY REB II
The American Civil War is raging at its height. The Union and confederate armies are recruiting anyone old enough to hold a musket. It is a time for brave and fearless men. You are Johnny Reb – one of the bravest of them all.
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INFANTRY
TURN 7
UNIT: 4
INFANTRY
An accurate full scrolling graphics battle simulation

Games Reviews

There are times when you need a break from the serious side of things, so Your Commodore brings you the latest choice in Commodore games.

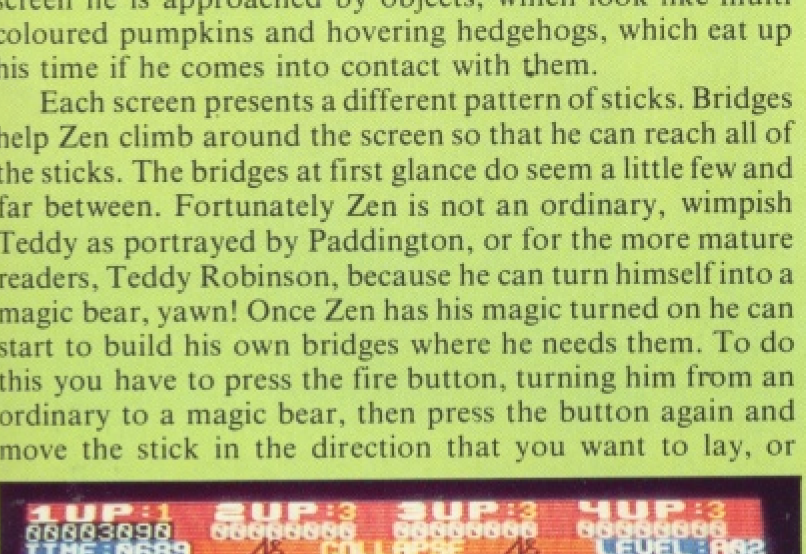
COLLAPSE

Collapse is an extremely apt title for this game, I nearly did by the time I'd fathomed out all of the controls for it. Of course if you've a quicker mind than I have you won't have too many problems. It isn't that there are lots of buttons or keys to remember as you use a joystick, however each position performs a different action and further options are added by combining the fire button with a direction.

Anyway, before I put you off trying the game, I'd better tell you what it is about.

The main character is a little teddy bear, at least he looks like one on the cassette sleeve, called Zen. Zen's aim is to change the colour of a sequence of sticks from grey to blue and then set up a chain reaction to collapse them all. Of course, during his task he doesn't go unhindered. On each screen he is approached by objects, which look like multi coloured pumpkins and hovering hedgehogs, which eat up his time if he comes into contact with them.

Each screen presents a different pattern of sticks. Bridges help Zen climb around the screen so that he can reach all of the sticks. The bridges at first glance do seem a little few and far between. Fortunately Zen is not an ordinary, wimpish Teddy as portrayed by Paddington, or for the more mature readers, Teddy Robinson, because he can turn himself into a magic bear, yawn! Once Zen has his magic turned on he can start to build his own bridges where he needs them. To do this you have to press the fire button, turning him from an ordinary to a magic bear, then press the button again and move the stick in the direction that you want to lay, or remove, a bridge. Now Zen can climb on it to reach more sticks.



To make the game still more complicated, Zen can't change the colour of the sticks while he is in his magic mode. Turning back to normal is simply a matter of pushing the stick forward and then carrying on as before.

It is possible to detain the aliens for a while, giving you a little more freedom as you wander around the screen. To do this you must turn Zen into his magic mode, pull back on the joystick and watch the magic dust appear. If the aliens run into this they will be trapped for a moment or two gaining you extra points.

Once all sticks are blue, or before if you feel like it, you can start to collapse the structure. This is done by carrying out the procedure for building a bridge, only this time moving the stick in the direction of a stick. This starts a domino effect causing the sticks to tumble down. Bonus points are awarded if you can collapse all the screen in one go.

I don't think you'll get bored with this game for quite a while as there are no fewer than 96 screens to tackle. The fact that the controls are a little complicated, the few examples I have given shows this, may put a few people off, though I must admit you do pick them up fairly quickly.

If you can stand the strain this game is extremely good value at £1.99. If you start pulling your hair out you can always give it to the kids to shut them up for a few hours.

J.G.

TOUCHLINE

Title: ***Collapse.*** *Supplier:* ***Firebird, Wellington House, Upper St Martins Lane, London WC2H 9DL.*** *Price:* ***£1.99***
Machine: ***C64***
Originality: ***10/10*** *Graphics:* ***5/10*** *Playability:* ***7/10*** *Value:* ***9/10***

MISSION A.D.

Industrial espionage is a dirty business and agent 1Y was none too pleased at being ordered to break into Odin's Liverpool headquarters. He much preferred killing to hunting down secrets.

And the mission had soon gone sour on him too. Dodging into a small cubicle in order to avoid a security

guard, he heard the door slam shut behind him. No amount of brute force or any number of bullets had any effect on the door. The only objects of interest in the cubicle were three buttons. A quick prod of them produced a sensation somewhat akin to being in a lift and time machine simultaneously. Finally, the machine stopped and another button opened a door into a room which seemed suspiciously like a library.

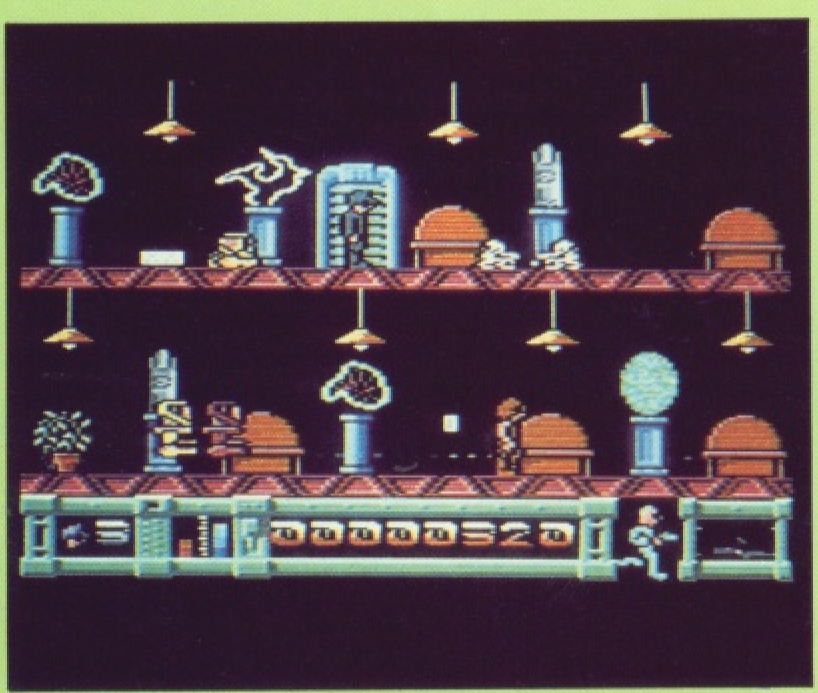
Pausing only to obliterate a passing robot with an apparently hostile intention, agent 1Y started to look at the books when a voice informed him that he had precisely 16 minutes to find and destroy five creatures. A picture of them appeared on the small screen and although they looked like men, 1Y knew that they may well be humanoids.

Unfortunately, they looked nothing like the droid that he had just blasted and already, his time was beginning to tick away. It wasn't quite the mission that he had in mind but it did involve lots of violence and there didn't appear to be much of an alternative.

The screen shows two levels of the area that you are in and you can see various droids, robots and humanoids running around and firing. Lifts move you between levels and the first thing to note is that although you can only see two levels on screen, an area may consist of several so that although you are on top of the screen, you may still be able to take a lift upwards. Teleport systems allow you to move to different areas and there is an elementary radar system showing the approximate location of your targets. The only hint that you have is not to blast anything that doesn't try to blast to you.

Your man is nicely animated as he runs round the library, cathedral and parks and the music helps maintain the atmosphere. Mission A.D. is a nice blend between shoot-em-up and arcade adventure and there is definitely a feel of "I'll just have one more go."

G.H.



TOUCHLINE
Title: ***Mission A.D.*** *Supplier:* ***Odin, Wellington House, Upper St Martins Lane, London WC2H 9DL.*** *Machine:* ***C64.*** *Price:* ***£9.95.***
Originality: ***8/10.*** *Graphics:* ***8/10.*** *Playability:* ***7/10.*** *Value:* ***7/10.***



ARCANA

King Valarequil (the baddy) rules the Northlands from the castle Arcana. Deep within the castle is the Dark Clavicle, the most powerful book on Black Magic ever written. Naturally, Valarequil would love to know what secrets are inside the book but there are problems. The clasp of the book is sealed and the special incantation that is needed to unlock it is only revealed when the light of Shedding Moon falls upon it. As that is tonight, the elves of Estarion have sent you to find and destroy the book and you arrive at the castle with only two and a half hours to go before the moon rises.

When you are as evil as this king, you don't leave anything to chance and so the book is heavily defended. The main line of defence is the small matter of seven demons. Fortunately, there also happens to be seven amulets which will protect you if you can find them. The second line of defence are the king's many minions who are hell-bent on sapping your energy. You can counter these by firing bolts of magical energy supplied to you by the elves.

The castle itself needs to be explored thoroughly. Most of it is a series of maze like corridors but there are also some 30 special rooms spread over the four levels. These may include useful items or help you if you are carrying a specific item. Therefore, if nothing happens when you first enter, the chances are that you will need to return later. Moving round the castle is straightforward. Some doors are open, some locked and some just stuck so that they open when you blast them. There are stairs leading to different levels and an ancient transport mechanism to be found and used.

Although it bears a passing resemblance to Ultimate's arcade adventures, I found that Arcana had a better gameplay and was much more addictive. Definitely worth a look if you enjoy this type of game.

G.H.

TOUCHLINE
Title: ***Arcana.*** *Supplier:* ***New Generation, 2–4 Vernon Yard, Portobello road, London W11 2DX.*** *Machine:* ***C64.*** *Price:* ***£7.95.***
Originality: ***7/10.*** *Graphics:* ***8/10.*** *Playability:* ***9/10.*** *Value:* ***8/10.***

HOODOO VOODOO

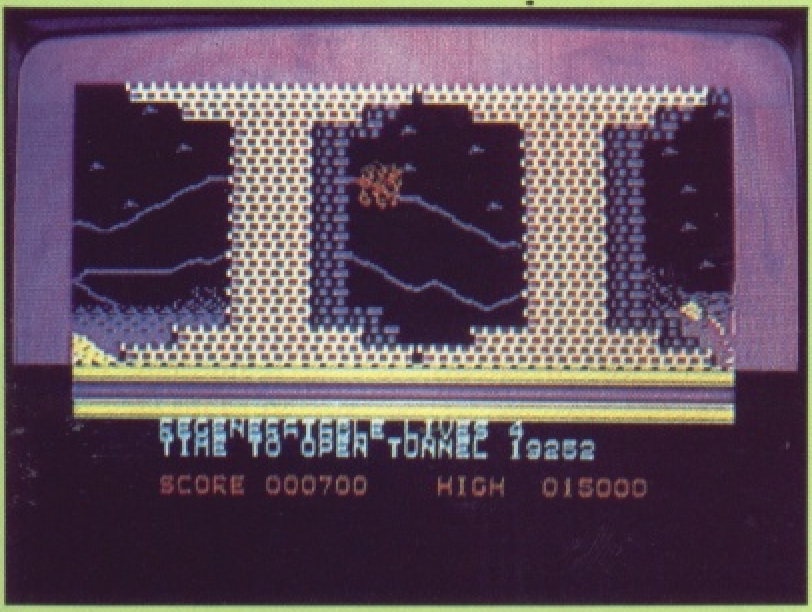
As usual, there is a decided dearth of superheroes. In fact, you are the only one remaining and have been charged with destroying the Boopalgrop (I kid you not) from Krellis IX.

Your first task on arriving on the planet is to pick up and deliver the seven Daggers of Power to the portal opening. There are no problems in actually locating the daggers as a large arrow gives you the all important clue. You can only carry one dagger at a time and you must avoid or blast assorted nasties as you travel through the hallways. The only problem here is that if an alien happens to be hiding behind a pillar when you pass behind it, you lose a life without knowing or seeing what hit you.

If you manage to complete the return journey seven times without dying, you get the chance to try and pick up pieces of garlic and crosses. It is just as well that you are told what y ou are looking for as the necessary items just happen to be invisible. No subtle hints here! Should you succeed in breaking the curse, you get a crack at the Alien Presence. He, it would appear, is not exactly over endowed with grey matter, for whilst he has carefully made his guardians impervious to the blasts from your gun, he will expire under a hail of bullets and not surprisingly, it is his destruction that concerns you most.

Hoodoo Voodoo is a below average shoot-em-up and even at its budget price does not represent particularly g ood value for money. G.H.

TOUCHLINE
Title: ***Hoodoo Voodoo.*** *Supplier:* ***Bug Byte, Victory House, Leicester Place, london WC2H 7NB.*** *Machine:* ***C64.*** *Price:* ***£2.99.***
Originality: ***4/10.*** *Graphics:* ***4/10.*** *Playability:* ***4/10.*** *Value:* ***5/10.***

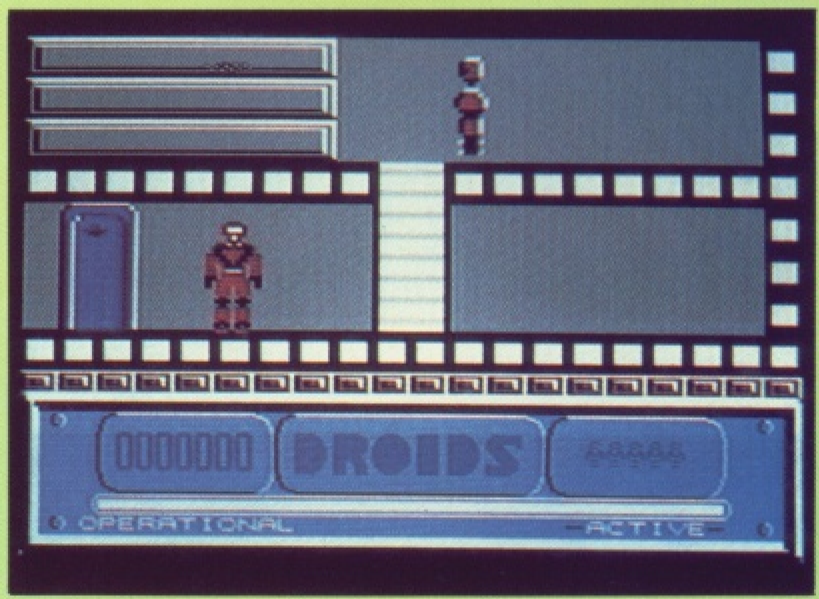


DROIDS

Due to an unfortunate accident involving solar flare, all computers on the prototype warship Arachnid are out of action and the ship's defence mechanisms have automatically been swtiched into red alert battle mode, programmed to destroy anything and everything that comes into range of its detectors. This could just prove to be a trifle embarrassing as the planet Venus is only 24 hours away. Because of this, you, as an agent of ILEA (Interglactic Law Enforcement Agency) have been briefed to shut down Arachnid whatever the cost.

By means of a sophisticated teleport system that the computer is incapable of overriding, you have been beamed aboard the ship and must attempt to close down each of the decks in turn. In order to do this, you must first clear the deck of all droids and then access a terminal and attempt to discover the correct five port code. You can then move to the next deck by means of an internal teleport system.

The droids must be shot several times before they are des-



troyed and have an annoying tendency to fire back whilst you are attempting this manoeuvre, depeting some of your energy if you hit. You must also avoid bodily contact with them as their defence mechanisms interact with yours causing a similar energy loss. This is somewhat annoying as when you move off the edge of one screen, you have no way of knowing the location of the droid on the next one. If you happen to walk right on top of him, it tends to be game over time (you only have one life).

Having destroyed the droids on a particular deck, you can try and close it down by accessing a terminal. Here you go into a mini-mastermind game. The code is a series of five bytes which can be either set or not. You have five goes to find the correct sequence. After each input, you are told how many bits have been set correctly. The terminals can also be accessed for other reasons. You can get a map of your surroundings (side and top views) and also attempt to gain some extra energy. This is not very well implemented and spoils an otherwise enjoyable game. The idea is that the energy packs must be dropped into gaps in a series of sliding blocks. If y ou succeed in getting the energy from top to bottom, it supplements your total. If you mistime a drop, the energy pod is lost. There are six pods on each deck. The problem is some horrible flickering scrolling which I found most off-putting.

These grumbles apart, Droids is a nice mixture of action and strategy. It would be ideal for someone who found Impossible Mission a bit too hard.

TOUCHLINE
Title: ***Droids.*** *Supplier:* ***Anglosoft.*** *Machine:* ***C64.*** *Price:* ***£7.95/£9.95 cass/disk.***
Originality: ***7/10.*** *Graphics:* ***6/10.*** *Playability:* ***6/10.*** *Value:* ***6/10.***

MISSION ELEVATOR

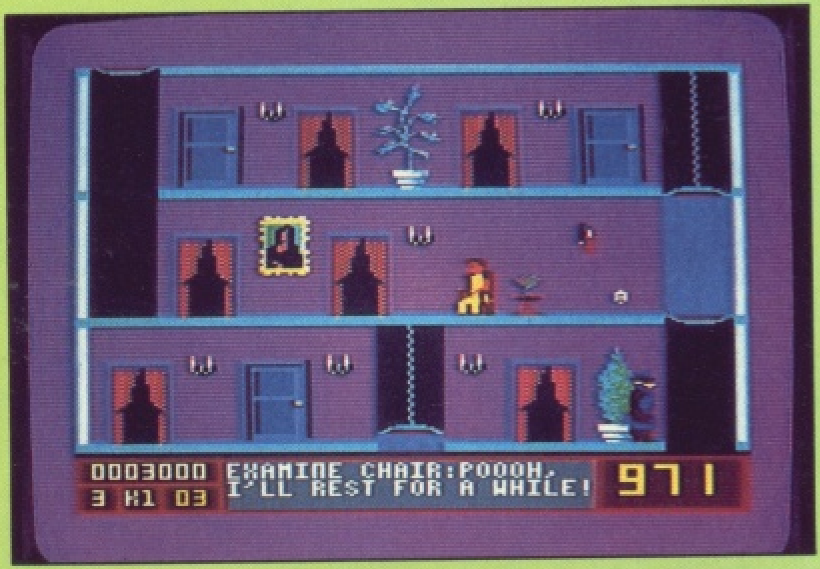
The FBI is in a mess. Foreign agents have taken over one of their Central Intelligence Units and are attempting to blackmail the American Government. Unless the White House gives in to the demands, the CIU will be blown sky high. Fortunately, an agent discovered that the bomb was hidden on the 62nd floor of a hotel and also learned the special code necessary to stop the bomb from being detonated. Unfortunately, he was then discovered but he did manage to leave several clues dotted round the hotel waiting for some brave agent to break in.

The hotel is split into units of eight floors and before you can move to the next unit, you (for it was you that was foolhardy enough to volunteer) must discover the location of the key to the emergency exit. This is owned by the porter who will quite willingly give it up if you can find him. This is no easy task though as first, you must search the furniture for a pass key that will let you open all the doors of the hotel and discover their contents. The hotel is also infested with enemy agents who will shoot on sight if you don't eliminate them first. You can also leap and duck out of the way of stray bullets as well as firing from a normal and low position.

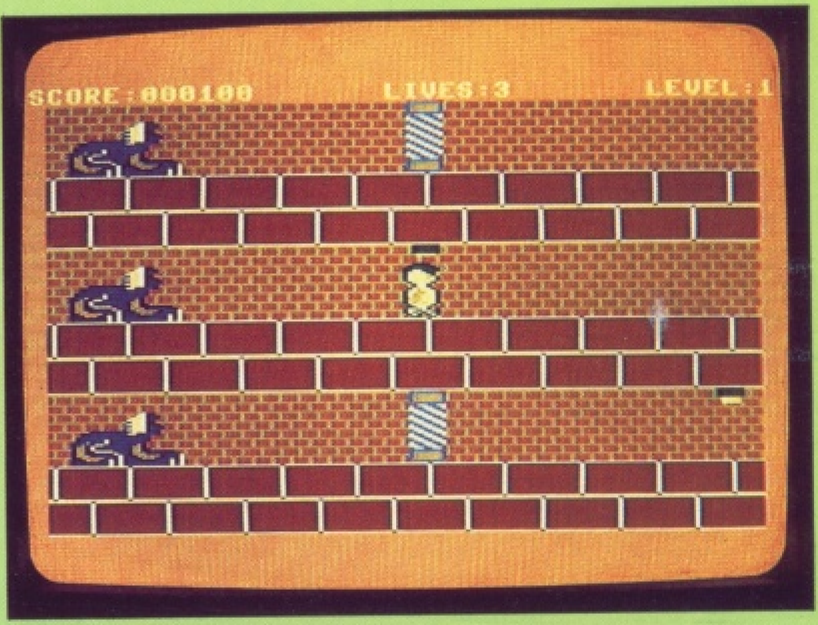
The hotel is full of features to be examined and explored. You need to find the various bits of password that will help defuse the bomb. There is money to be found which can be spent at the bar or gambled away in a game of dice. Clues are also hidden in furniture although you should be careful exactly what you examine. An electric socket gives a nasty shock if you insist on looking at it too closely and you can also have fun with the fire extinguishers. Movement through the hotel is by a series of lifts hence the title of the game.

Although it sounds fairly simple to play, believe me it's not and you will find yourself getting wasted fairly frequently. The graphics are colourful and quite well animated, especially the enemy agents. A nice original arcade adventure that even though it is very difficult to finish, is very simple to play and always demands 'just one more go'.

G.H.



TOUCHLINE
Title: ***Mission Elevator.*** *Supplier:* ***Micropool:*** *4 Mercury House, Calleva Park, Aldermaston, Berks. RG7 4QW.*
Machine: ***C64.*** *Price:* ***£9.95/12.95 cass/disk.***
Originality: ***8/10.*** *Graphics:* ***7/10.*** *Playability:* ***7/10.*** *Value:* ***7/10.***



TOMB OF TARRABASH

Have you ever played any of those games which are set inside an ancient tomb where there are statues and weird creatures and of course, the inevitable mummies?

There is another in that genre and it lacks a lot of originality and is really quite tedious.

Once you've worked out how to play the game and how the controls work you're halfway there.

The character which you control (looking absolutely nothing like Indiana Jones!) can walk left and right and jump. You'll need to get the hang of jumping as soon as possible because there are some very wide gaps to negotiate. If you fall down the stair gaps it doesn't matter but if you fall in a sandpit then you dissolve very quickly and lose a life.

You can also walk behind the stairs if you jump as you are approaching them so there aren't as many dead ends as first impressions create. If you stand behind the stairs then you're safe from the monsters too. This is quite handy as you can wait till there are less of them around to kill you before you cautiously emerge.

Other traps include bars which come down on you just as you walk beneath them and giant saws which do likewise. However, these can be slowed down considerably by nutting buttons in the ceiling of the tunnel. There are plenty of these around all operating different traps so the best thing to do is hit them whenever you see them.

You may find that this game appeals to you, but on the whole I think it's far too tedious. Even with the limited memory available I think that more imagination could have gone into it.

M.C.

TOUCHLINE
Title: ***The Tomb of Tarrabash.*** *Supplier:* ***Audiogenic, 39 Suttons Industrial Park, London Road, Reading RG1 6AZ.***
Machine: ***C16.***
Originality: ***4/10.*** *Graphics:* ***5/10.*** *Playability:* ***3/10.*** *Value:* ***4/10.***

SPEED KING

The smell of petrol, the sound of powerful engines revving, the odour of leather and sweat and the pumping of your heart as you await the starter's signal. The crowd is tense, the engines roar and the man-machine team moves as one at unthinkable speeds.

Motorbike racing has had a lot of coverage in the computer games market but there is always room for a better version of an old formula and Speed King has a lot going for it in terms of excitement and addictiveness.

The lay out of the game is simple. You can choose from four courses; Hockenheim, Monza, Silverstone or Paul Ricard. They all look similar though the sky and track are in different colours and some are slightly longer. Not being familiar with these famous circuits I cannot tell whether they are authentically reproduced here.

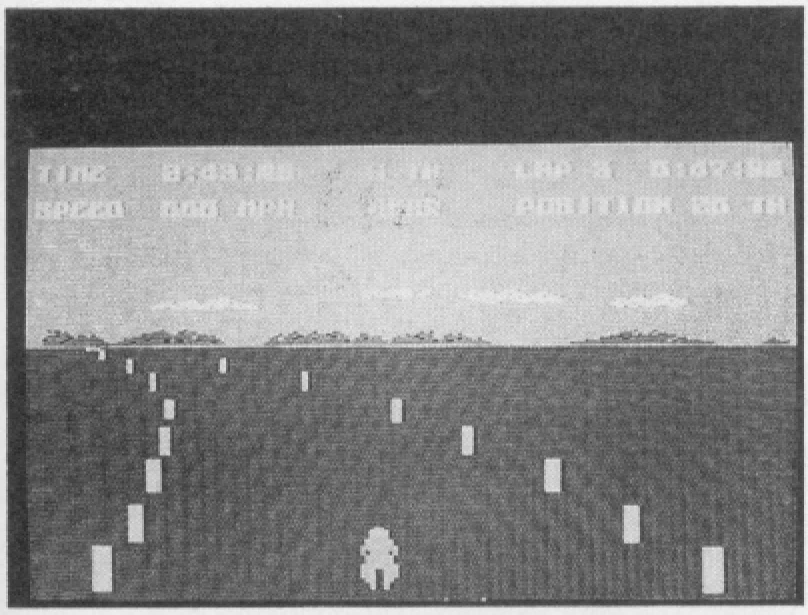
Once you have chosen your course you appear at the starting line and off you go.

At the top of the screen is all the information you need to check up on your progress. You are told your speed, gear, time, which lap you are currently on and your position in relation to the other 19 riders.

To get your speed up you have to work your way to top gear. Maximum speed is 240mph. Once you have the hang of the steering and you have perfected your overtaking technique then there should be no stopping you. Having said that, I haven't yet completed a race without coming off. When you do crash you disappear in a ball of flame and then miraculously reappear unharmed to take up the challenge where you left off.

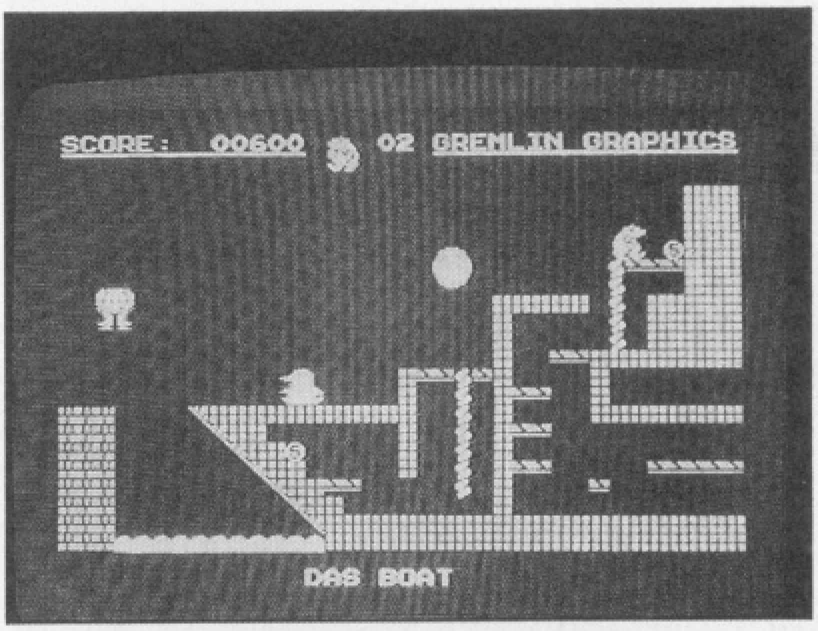
One quite major criticism of this game is the ease in which you can hold the lead. This may sound pretty but once you have the knack of controlling your bike it is a fairly simple matter to put yourself ahead of the field and stay there. As long as you keep your speed above 200mph then there's no way any of the other bikes can catch up. In once race I actually took the lead in the first lap and held it for the complete five lap race. I never saw another rider! This means that the circuit gets a little tedious especially as you don't even seem to be able to lap anyone.

Having said all this the game was a big hit in the office. It's possible to set up some quite good tournaments by attempting to beat the lap record. I've played it a lot and I'd play it again since setting new objectives – not crashing at all, beating the course record, or your friends best time – gives it more of a lasting appeal than perhaps would be expected. Don't forget too that it's only £1.99!



TOUCHLINE

Title: ***Super King****. Supplier:* ***Mastertronic, 8-10 Paul Street, London EC2****. Price:* ***£1.99***



MONTY ON THE RUN

Monty Mole, that eternally endearing little character from Gremlin, is back in this game for the C16.

Having seen the 64 version some time ago, I was looking forward to this and it wasn't a disappointment.

The graphics are quite colourful and effective and the little character, although looking more like a short, squat teddy bear than any mole I've ever seen, is quite agile and can take any number of falls seemingly without physical damage.

As a platform game, it is, of course, full of all the usual hazards. There are numerous floating alien type beings who must be avoided. In fact it is advisable to give them a very wide berth since some of them seem to have a force field around them which is as deadly as the beasties themselves. Others can be approached without much danger except when you actually touch them. When you die there is a ghastly crunching sound that makes you feel as if all your bones are being ground to pulp. Not very nice.

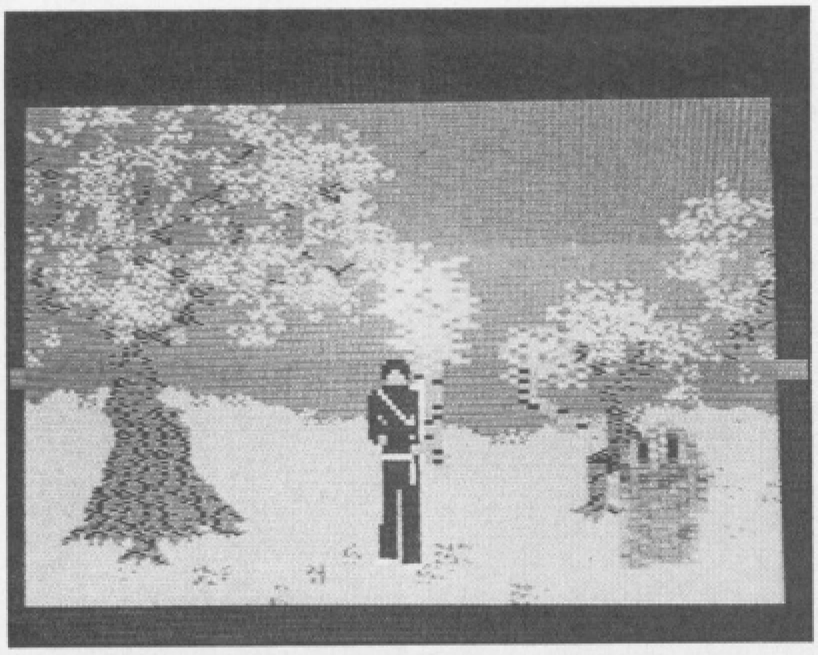
One danger worth watching for is the pistons which shoot down at irregular intervals and squash you to pieces. On one screen it is impossible to avoid this untimely death if you walk on at the wrong place. I managed to die in exactly the same place three times before I sorted this out.

Despite the fact that this game is not really original (think of a platform game and all the classic qualities are here), it has an addictiveness which is difficult to explain. If you've got a C16 and a bit of spare cash then I thoroughly recommend this game. Treat yourself. **M.C.**

TOUCHLINE

Title: ***Monty on the Run****. Supplier:* ***Gremlin Graphics, Alpha House, 10 Carver Street, Sheffield S1 4FS****. Price:* ***£6.95****. Machine:* ***C16.***

Originality: ***5/10****. Graphics:* ***7/10****. Playability:* ***10/10****. Value:* ***9/10****.*



BEYOND THE FORBIDDEN FOREST

Connoisseurs of C64 games may remember the excellent Forbidden Forest of a couple of years ago. Well, you guessed it, this is the sequel. For those of you not lucky enough to see the original the game went something like this. You armed with your trusty bow and arrow must run through the forbidden forest avoiding and killing the monsters that are out to get you. The nasties appeared in waves and such creatures as giant frogs and skeletons were after you.

When this program first appeared a bit of an outcry developed in some of the magazines since the graphics in the game were extremely gruesom, especially the spurting blood when you killed or were killed. Well you'll no doubt be pleased to know that Beyond the Forbidden Forest offers the same amount of horror but with an even better game.

According to the instruction sheet, Beyond the Forbidden Forest is a game written in four dimensions. The four dimensions are described as the following. Left and right movement as you would expect and the passage of time as with the original game, but now you can also move into and out of the background. This means that instead of simply running left and right in front of all the objects it is now possible to run behind them to hide from a monster or simply charge into the background to attack a particularly ugly looking monster. This added dimension certainly adds something to the game and makes it all the more difficult to play. One extremely nice touch is the way that both you and the monsters get smaller as you move 'into' the picture, the fact that you get smaller the farther away you are is something that many games overlook.

As previously mentioned you are armed with a bow and arrow. Controlling this at first is a little bit of a problem but you soon become used to it. The reason that it is a little trick is that on a press of the fire button your aim is taken alternately higher and lower, whatever position you release the fire button in is the height that your arrow is fired at. Once you are used to this then control is excellent though at the start of the game you will no doubt find your precious arrows flying off nowhere near the monster.

As for the monsters, well you couldn't hope to meet a more disgusting bunch. Firstly you'll have to face the worms which pop out of the ground with a frequency that tells you that they certainly don't like you. Get too close to one of these and you're sure to be pulled under ground for dinner. Watch the screen and you'll soon see the worm re-appear and regurgitate what is left of you back into the playing area, I told you the game was blood thirsty.

Once you have dispatched the worms it's on to the dragonfly. Again take careful aim before this enormous sized fly carries you off for its dinner, accompanied by the usual gory effects of course. Following its on to face the chimera.

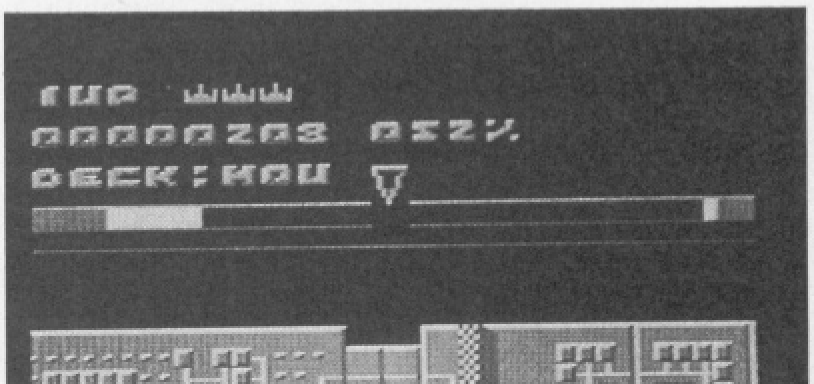
As you kill a monster then some mysterious power gives you a golden arrow, to use later in the game. Should you loose a life then arrows are taken away and you are re-incarnated to fight once more.

Once evening arrives, and if you have enough arrows, then its off to fight the monsters in the underground caverns. Firstly you have to face the bats swooping at you from all directions. Next comes the hydra, a four headed monster breathing fire at you from each mouth, not a pretty sight. Should you ever defeat this then it's on to face the ultimate monster 'The Demonorgon', firing bolts of fire at you from each eye this is a monster that must be despatched very quickly, if not then it will certainly despatch you.

Playing Beyond the forbidden forest is rather like playing the part of the hero in some epic horror movie. The animation of the monsters is excellent and the atmospheric music certainly helps set the scene.

If you aren't squeamish then I suggest that this is one game that is a must in your collection. However, don't play it too late at night, you never know what might happen.

TOUCHLINE Name: ***Beyond the Forbidden Forest.*** *Machine:* ***C64.*** *Supplier:* ***US GOLD, Units 2/3, Holford Way, Holford, Birmingham, B6 7AX.*** *Tel:* ***021-356-3388.***
Originality: ***6/10.*** *Graphics:* ***9/10.*** *Playability:* ***8/10.*** *Value:* ***9/10.***



W.A.R.

Scrolling space battle games certainly received a boost in popularity when Uridium appeared. W.A.R. is certainly a variant on this theme complete with gigantic scrolling spaceship, enemy craft hot on your tail and of course lots of things to shoot.

At first glance W.A.R. does seem to offer a great deal of excitement with an excellent scrolling background and lots

of enemy fighters, its only after playing it for a short while that the tedium sets in.

The actual scenario for the game is a chain of cylinders, the inside of which is a complete city. Your job is to destroy each of 20 cylinders each of which has a specific purpose. When your ship enters a cylinder a self destruct timer is initiated. After this timer has run down an escape portal opens for the enemy to escape through, you must get to this and follow them through before the ship cylinder blows up.

Actually making it to the portal is, on the first level anyway, a piece of cake. The enemy fighters aren't particularly nasty and aren't that quick. However once you reach the portal things are a little different. Before you can go through the portal you must de-code the colour lock. Not an easy task. To decode the lock you must shoot all of the coloured squares that re the same colour as the top line of the screen. Oh, and the blocks are moving. After many hours of playing I must admit that getting through the lock is extremely difficult it not nearly impossible. I can't help thinking that the programmers simply added this stage of the game to make life a little more interesting, after all the first level is extremely easy. It is extremely irritating to find that you survived a level only to loose your ship because you can't get past the lock. I rarely lost a life while battling it out on the cylinder.

In my view W.A.R. is a game that had a lot of potential which failed to come through. Summing up best done by quoting someone who played the game by saying 'it's a 2nd class Uridium'.

TOUCHLINE *Name:* ***W.A.R.*** *Price:* ***£8.95.*** *Machine:* ***C64. Supplier: Martech, Martech House, Bay Terrace, Pevensey Bay, East Sussex. BN24 6EE.*** *Tel: (0323) 768456. Originality:* ***4/10.*** *Graphics:* ***8/10. Playability: 6/10.*** *Value:* ***6/10.***

MIAMI VICE

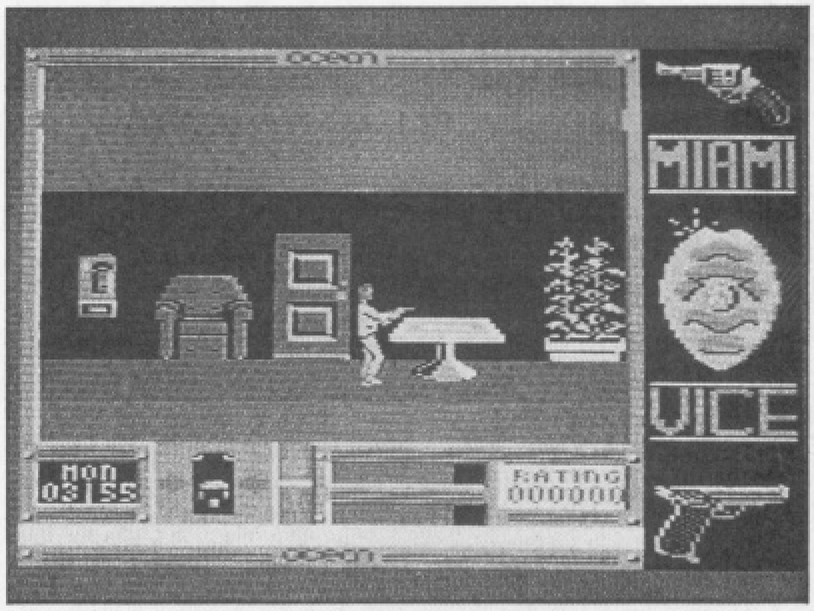
Programs based around TV or film titles are bound to sell on their titles alone. This is obviously a good thing for the software houses, but I can't help wondering how the buyers will feel if the game doesn't live up to their expectations.

Miami Vice, as its name suggests, is based upon that extremely popular TV series of the same name. Crocket and Tubbs have heard that a shipment of contraband is due in town. Your job is to get out on the streets and find the contraband.

You are supplied with a set of possible meeting places for the gangsters involved with this caper, together with the times that the gangsters may be there.

Now appears the first problem. You have a drive around town and try to reach a meting place where the gangsters may be, at the correct time of course. Having worked for quite a while in this town you would have thought that our heroes would know their way around. Not so, finding the correct bar is a feat in itself, nevermind getting there at the correct time. My advice is to spend your first few hours playing the game making a map. I say hours, as the playing area is extremely large and it is very difficult to drive around.

Ocean has obviously realised this, since, a few days after the game arrived, they sent me a map of the city with all of the bars etc. marked upon it. This was a godsend as I must admit without it I would have tired of the game extremely



quickly and probably never have got as far as meeting a criminal.

Driving around the town presents quite a big problem as there seems to be something fundamentally wrong with the design of the car. If you were driving down the road with a car of your left and you wanted to turn right, you would think that there would be no problems. Wrong, turn your car to the right and your back end will swing out clonking the other car and sending you back to the start. If you should drive close to the edge of the road and try to turn away from it the same happens. This makes it impossible to turn in certain circumstances, the only option open to you is to crash. Now I don't know about you but I've never been in a car that suffered from this problem.

Once you actually reach your destination, if you ever do, you have to be very careful of the time. If you arrive too early the crooks will spot your car and drive off. If you enter a meeting just as it starts then the crooks will have fled leaving the evidence behind. If you enter four to eight minutes after a meeting has started then you may find a crook carrying evidence. If you enter eight to 12 minutes after a meeting has started then the location will be deserted, though if you leave quicky enough you may spot the crooks in their getaway car and give chase through the streets firing at them out of your window.

Overall control of the game is quite simple, even if the actual game play is complicated, though a large number of options are available from the joystick (shoot, leave car etc.). The graphics, though not brilliant, in the road scenes are adequate with a superb smooth scrolling city background seen from above. The meeting places, bars, are quite well detailed and searching through the rooms looking for the crooks and evidence is quite atmospheric.

Fans of the TV series will no doubt turn up their TV's volume as the familiar TV theme and rock music is played by the computer, played at a high volume this does add something to chasing around town looking for crooks.

I can't help thinking that due to the fact that the game lacks a little in playability it will hold your interest for little time. Miami Vice suffers from a severe case of 'nice idea, shame about the game'.

TOUCHLINE *Title:* ***Miami Vice.*** *Machine:* ***C64.***
Supplier: ***Ocean, Ocean House, 6 Central Street, Manchester M2 5NS.*** *Tel:* ***061-832-6633***
Originality: ***9/10.*** *Graphics:* ***8/10.*** *Playability:* ***4/10.*** *Value:* ***6/10.***

POWERPLAY

There have been many attempts to bring question and answer quizzes to computer screens but most have tried to copy Trivial Pursuit too closely. Powerplay forsakes the pie slice board game to provide a new and exciting recipe.

The screen display is taken up by a chessboard matrix in a classical setting like Ancient Greece. At the corners of the board stand two pieces and the idea of the game is to conquer your challengers by superior general knowledge and fast reflexes.

The questions appear beneath the board and the four optional answers appear. Whichever option you think is correct can be selected by keyboard or joystick and the answer affects the boardgame.

A correct answer allows you to move one of your pieces one square on the board or to increase its power. When two opposing pieces are on adjacent squares a challenge can be issued. The combatants must prepare to spot the correct answer to randomly selected questions and the one who wins diminishes the power of the opponents piece. If the pieces are both very strong, the speed battle must be repeated on successive moves until one of the players decides that it is time to run for cover before his character is destroyed.

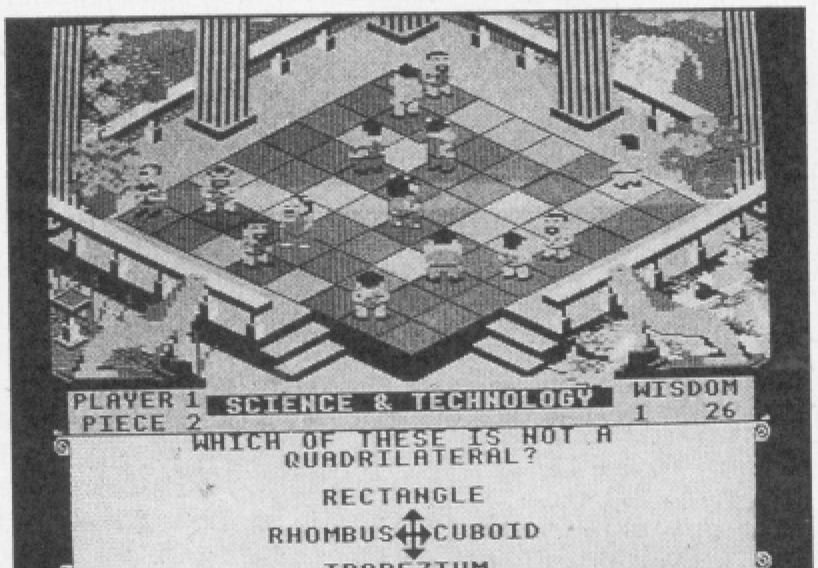
Flashing squares around the board act as a teleport device which allows fast movement around the board to another flashing square. This is especially useful for a fleeing piece, as long as it doesn't take it to a square near an even more powerful foe.

The questions are varied and taxing with three sets available with the game. Also included is a question base compiler which allows you to construct your own quiz. This is especially useful for families where children would find the questions far too difficult. A quiz centred around nursery rhymes or even school work would turn the drudgery of learning into a pleasure.

When we played the game in the office the interest was high with everyone trying to get in on the action. This is the supreme accolade which few games seem to achieve and even fewer manage to sustain. Perhaps its addictive qualities derive from the ability to clobber your opponent with superior knowledge, or even by successful guesswork, but it certainly has pulling power.

The graphics are quite cute with the pieces evolving from a lower warrior towards a top ranking minotaur. Once the higher eschelon has been reached further correct answers merely add to its strength and very powerful battles can be joined at the climax of the game.

Although the game is well devised and professionally executed I still don't feel that the ultimate game of this type has been achieved. Powerplay goes a long way along the road towards the definitive work and as it stands is on a par with US Gold's Mind Pursuit. Together these games are streets ahead of their rivals but the road is long. **L.D.**



*TOUCHLINE Title: **Powerplay**. Supplier: **Arcana**. Machine: **C64**.*
*Originality: **8/10**. Playability: **9/10**. Graphics: **8/10**. Value: **8/10**.*

PARALLAX

You, together with one of the Earth's most eminent scientists have landed on an artificial world. Everything was going well until you discovered some secret information that showed that the inhabitants of this world were planning a surprise attack on Earth. The once friendly natives immediately turn hostile and it is up to you to find your fellow scientists and an Intergalactic Teleport in order to make good your escape.

The planet is divided into five main zones, alpha, beta, gamma, delta and epsilon and there is one of your friends in each zone. There are many other scientists in each zone and you must capture or kill them in order to learn about the password that will admit you to the next zone. These are to be found in hangars which also contain computer banks, shops and intelligence units. These can only be entered on foot and so it is necessary to leave the relative safety of your ship and wander round, making sure that you possess enough oxygen and ammunition for your journey.

As you eliminate the scientists, so you can pick up their data cards which serves you two useful purposes. Firstly, it allows you access to part of the code, but it can then be exchanged at the bank for a number of credits with which you can then stock up on your requirements. You need to capture one of the scientists but he will refuse to help you unless you have acquired some drugs and use them on him.

Having explored your immediate surroundings on foot, you will want to move elsewhere so it's back to your ship and ready for take off. Your craft is highly manoeuvrable and can fly under as well as over certain parts of the superstructure. This is just as well as you are under constant attack from the enemy forces. You can gain extra speed by flying through a black hole and can teleport to another part of the zone again by flying over the appropriate unit. You will certainly need to activate your shields and remember to put your landing gear down before you land again.

Parallax is a fast action packed shoot-em-up that will certainly appeal to fans of the genre although I felt that the different elements of the game didn't quite fit together properly. The graphics are certainly very slick apart from an appalling opening sequence which seems designed to induce fits of epilepsy with its stroboscopic effects. **G.H.**

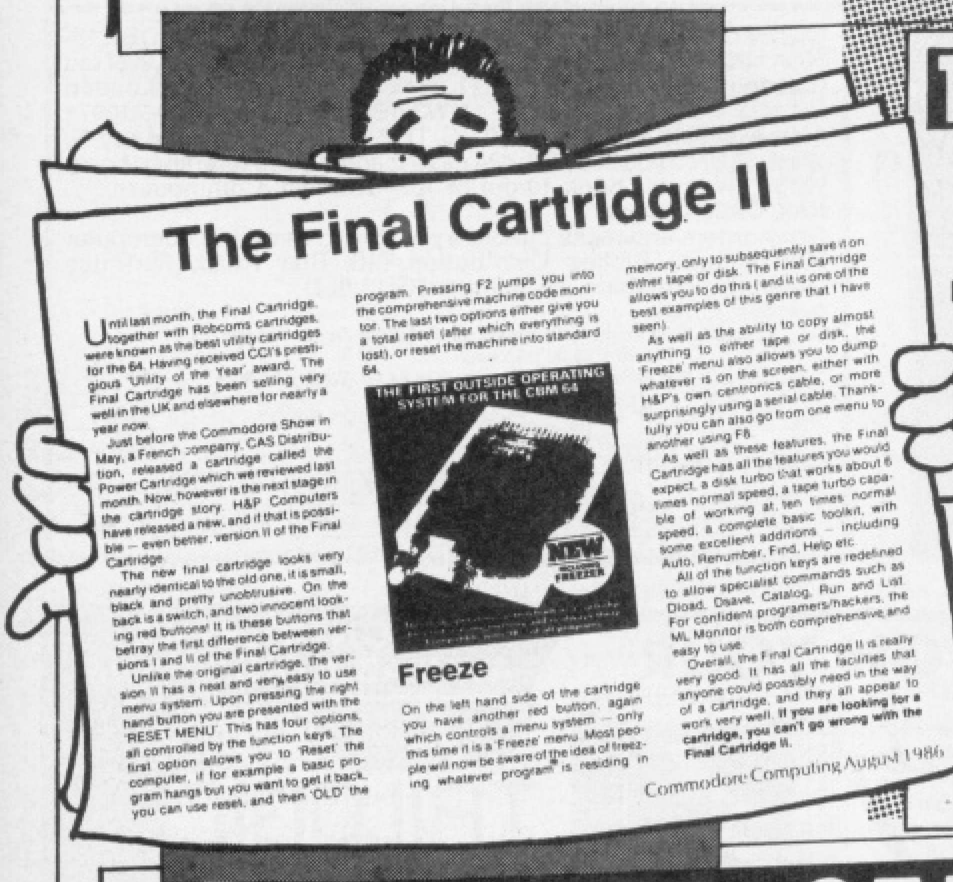
TOUCHLINE
*Title: **Parallax**. Supplier: **Ocean, Ocean House, 6 Central Street, Manchester M2 5NS**. Machine: **C64**. Price: **Cass £8.95 Disk £12.95.***

*Originality **7/10**. Graphics: **8/10**. Playability: **6/10**. Value: **6/10**.*

THE FINAL CARTRIDGE II

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The Final Cartridge II

Until last month, the Final Cartridge, together with Robcoms cartridges, were known as the best utility cartridges for the 64. Having received CCI's prestigious 'Utility of the Year' award. The Final Cartridge has been selling very well in the UK and elsewhere for nearly a year now.

Just before the Commodore Show in May, a French company, CAS Distribution, released a cartridge called the Power Cartridge which we reviewed last month. Now, however is the next stage in the cartridge story. H&P Computers have released a new, and if that is possible — even better, version II of the Final Cartridge.

The new final cartridge looks very nearly identical to the old one, it is small, black and pretty unobtrusive. On the back is a switch, and two innocent looking red buttons! It is these buttons that betray the first difference between versions I and II of the Final Cartridge.

Unlike the original cartridge, the version II has a neat and very easy to use menu system. Upon pressing the right hand button you are presented with the 'RESET MENU'. This has four options, all controlled by the function keys. The first option allows you to 'Reset' the computer, if for example a basic program hangs but you want to get it back, you can use reset, and then 'OLD' the program. Pressing F2 jumps you into the comprehensive machine code monitor. The last two options either give you a total reset (after which everything is lost), or reset the machine into standard 64.

THE FIRST OUTSIDE OPERATING SYSTEM FOR THE CBM 64

NEW

Freeze

On the left hand side of the cartridge you have another red button, again which controls a menu system — only this time it is a 'Freeze' menu. Most people will now be aware of the idea of freezing whatever program is residing in memory, only to subsequently save it on either tape or disk. The Final Cartridge allows you to do this (and it is one of the best examples of this genre that I have seen).

As well as the ability to copy almost anything to either tape or disk, the 'Freeze' menu also allows you to dump whatever is on the screen, either with H&P's own centronics cable, or more surprisingly using a serial cable. Thankfully you can also go from one menu to another using F8.

As well as these features, the Final Cartridge has all the features you would expect, a disk turbo that works about 6 times normal speed, a tape turbo capable of working at ten times normal speed, a complete basic toolkit, with some excellent additions — including Auto, Renumber, Find, Help etc.

All of the function keys are redefined to allow specialist commands such as Dload, Dsave, Catalog, Run and List. For confident programers/hackers, the ML Monitor is both comprehensive and easy to use.

Overall, the Final Cartridge II is really very good. It has all the facilities that anyone could possibly need in the way of a cartridge, and they all appear to work very well. **If you are looking for a cartridge, you can't go wrong with the Final Cartridge II.**

Commodore Computing August 1986

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Pick of the Sticks

If all that zapping has finally left your joystick in a state of collapse then read on to find out the best buys for games players.

By Eric Doyle

We've all heard that a bad workman blames his tools but there are occasions when the workman may be bad because of his tools. Choosing a joystick is far more than just stringing along with the latest trend. Ponder on the ergonomic complexities and you'll soon appreciate the art of the joystick maker.

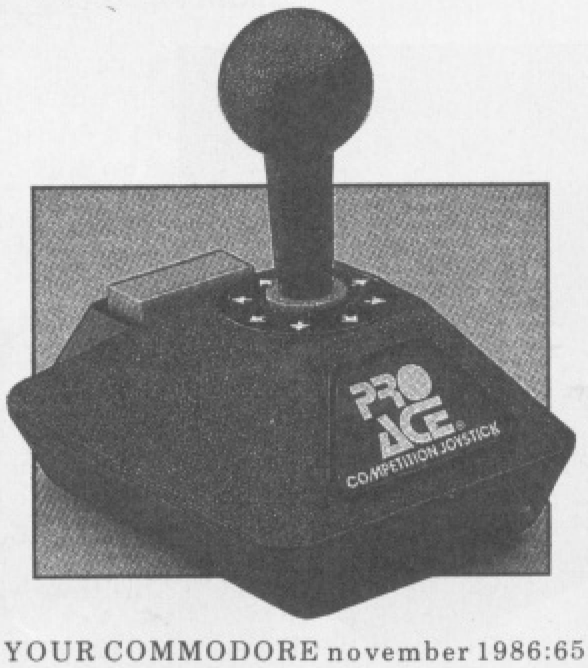
Firstly there is the problem of which hand to use. Left-handedness is no longer considered to be a sinister defect so the perfect stick should be symmetrical. In simple terms this means that if the fire button is not centrally positioned then there should be two of them.

The second consideration is a little more tricky because it depends on your style of play. Most people seem to prefer holding the base in their weaker hand while waggling the stick with the other. Problem number one is how large is the human hand? Obviously there is no fixed rule, all hands are different and so this area is open to much speculation.

As a student I worked on a Kit-Kat production line where I learned that the thickness of the chocolate bar is a tenth of the span of the average adult hand. As a packer I knew that a handful of Kit-Kats woulds slot nicely into a box, designed to hold 10, which made the job extremely easy. What if my hands were not within the parameters of averageness? The result would be cramp and aching muscles. So it is with joysticks. Choose the wrong size and your gameplay will suffer.

Finally, we must consider the sensitivity and robustness of the sticks manufacture. Robustness is essential, after a hard session of alien bashing.it is very irritating to find that the ultimate high score has been missed because the stick has become detached from the base or because one of the switches has failed. Some people really give the control unit a lot of stick while others prefer delicate movements. For the former a highly robust but insensitive stick would suffice but for the latter a more subtle unit with less 'throw' would be best.

Unfortunately, most players are joystick bashers but the Commodore joysticks have all proved to lack the necessary sturdiness. This has left the field wide open for independent companies to provide a range of sticks to suit all tastes.



The Pro-Ace Competition Joystick is probably one of the most physically robust sticks on the market. If you come from north of the Border you'll appreciate that using this beast is akin to stirring good thick porridge. In other respects the stick is beautifully designed. The base is small enough to fit comfortably in the hand and is stable enough to stand on a desk top. The fire button is a centrally positioned bar which can easily be operated by the side of the thumb. This gives a better grip for the supporting hand which is essential because the stick takes some pushing and pulling to make it work.

If you're not into bench presses and weight lifting, the Micro-Ace is a better bet. This is the same design as the Pro except for one crucial difference. The internal switches are not the crude leaf switches of the cheaper unit and the Micro label refers to the use of microswitches internally. These not only ease the amount of pressure required but are also less likely to fail.

Often differences between joysticks only become obvious when you delve inside. Take the Euromax and Micropro. On the face of it the only difference is the shape of the twin fire buttons. Rather novel square buttons on one and oversize round

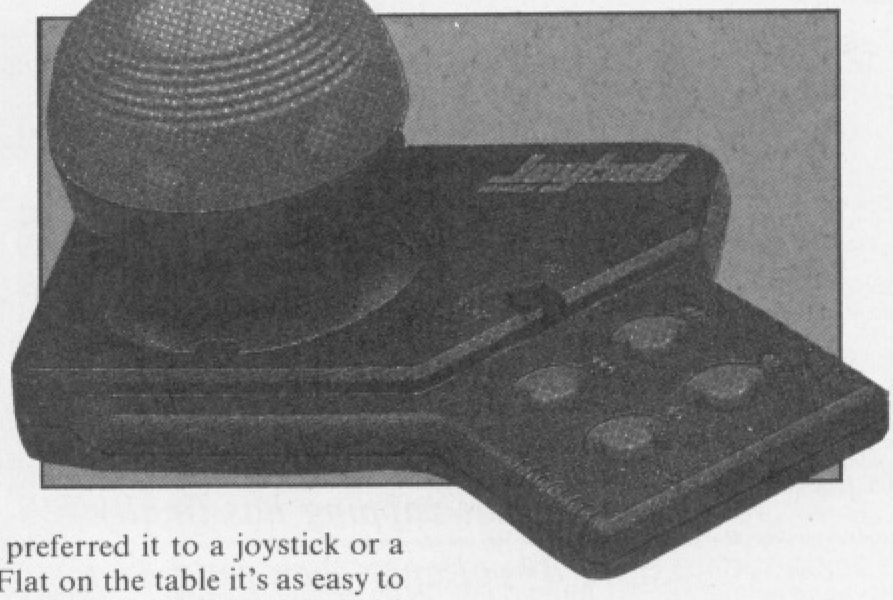
ones on the other. Plug them in and give them a whirl and one thing becomes very clear, the Micropro stick is sluggish and the buttons less reliable. Added to this the Euromax has a continuous fire button switch on the back for those games where ammunition is not at a premium.

Both sticks use microswitches but a look inside reveals that the Euromax has a longer central spindle. This gives better leverage on the switches and means that less effort needs to be applied in pushing the switch contacts around. Compared to the Pro-Ace either stick is easier to operate but the bases are much larger and small fingers may find it easier to rest the stick on a firm surface.

When is a stick not a stick? This may sound like a nursery riddle but just look at the Wiz Card and the Joy Ball.

The Wiz Card is small, inexpensive and innovative. Instead of the usual macho stick protruding manfully from its base, there is a small pad about the size of a 10 pence piece. This can be operated by the pressure of your finger but is not as sensitive as a traditional stick. Part of the problem is the way the pad is positioned at the front of the card. If the fire buttons and the pad were transposed, the quality of the card would increase. To test the theory I turned my monitor upside down and reversed the card in my hand. Immediately the card felt more comfortable and, despite the eccentricity of the inverted screen, my success rate increased.

As a serious game controller the Wiz Card is not a general purpose unit. Fast action leaves it behind but its neat appearance does lend it to business software or graphics and music utilities. In these areas I found I actually preferred it to a joystick or a mouse. Flat on the table it's as easy to use as a doorbell, leaving one hand free to scratch your head or hold your coffee.



Hand-held is not a term applicable to the Joy Ball. The size of the unit makes it desirable to find a nice flat surface. I've grown quite attached to this monster. At first I thought it was all gimmick and no action but a few minutes practice soon proved me wrong.

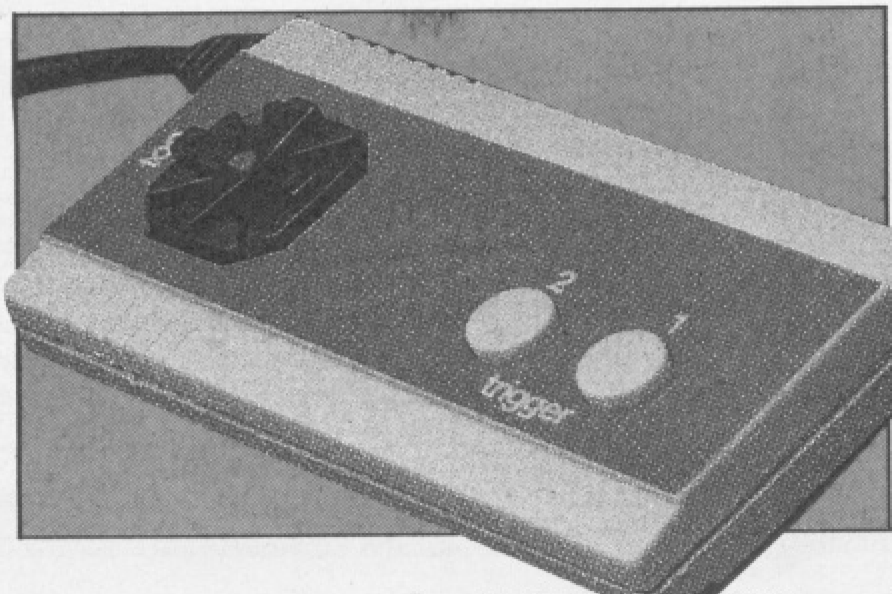
The Ball should not be confused with the rotating joyballs used on arcade machines. These are just mice lying on their backs. The Joy Ball is just an obese joystick and operates by rocking it in the desired direction. Because you don't have to grip it the strain is less than with a conventional stick and this makes it ideal for anyone with manual disabilities.

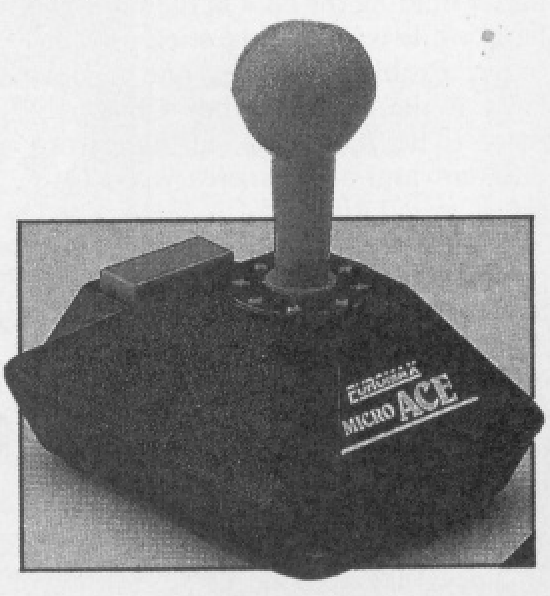
I'm afraid that left handers will find the button positions awkward to use but the ease with which the ball rocks does mean that a weak right hand could cope with this.

The array of buttons look formidable at first but they are probably the best selection available. The right hand pair are just normal buttons but the left pair are rapid fire units. On shoot-em-ups the rapid buttons are superb allowing speedy salvos to be fired, the other buttons are available for more subtle applications.

To attempt to recommend a joystick from this selection would be a pointless task. It all depends on your needs and physical make up. Personally I prefer the Euromax and the Joy Ball but I would recommend that you search out a good retailer who will let you try out a range of sticks. The main criteria relate to the sensitivity of the unit and how comfortable you feel when using it. Always make sure that the aliens are going to come off worst at the end of the day. YC

Touchline
Euromax Electronics Ltd, Pinfold Lane, Bridlington, North Humberside. 0262 602541.





Contributions

So you own a Commodore? So you've written some programs? So why haven't you sent them to us?

Your Commodore is always on the look out for new programs, hints and tips, articles and even regular series. In fact if you have something that you think could be of use to other Commodore owners we want to hear about it.

So if you have got something which you think we may be interested in. How do you go about submitting it to us?

Below you will find a list of guidelines that will help us to deal with any item that you send in to us. We don't expect everybody to be the next William Shakespeare but if you do follow these simple rules then it will make our job a lot easier.

1) If possible all material sent to the magazine should be typed or printed out on a computer printer.

2) All text should be double spaced i.e. there should be a blank line between each line of text. You should also leave a margin of about 10 characters around the text.

3) On the very first page you should put the following:
Name of the article
Machine that it is for
Any extras required – disk, printer etc.
Your name
Your address
Your telephone number

4) The top of every page should have the following information on it:
Abbreviation of the article title
Your name
The page number

For example, suppose you had submitted an article on C64 interrupts. You should put something like the following at the head of the page:

Interrupts/J.Smith/1

5) Please make sure that you do not make any additional marks on your text especially underlining.

6) Try and write in clear concise English, it does not have to be a work of literature but it must be comprehensible.

7) On the bottom of each page you should put the word MORE if there are more pages to the article or ENDS if it is the last page.

8) If possible, enclose a listing of all programs.

9) Under no circumstances use a staple to hold the pages together. Use a paperclip instead.

10) Programs should be included on either disk or tape. Make sure that you SAVE two copies of every program so that we have a better chance of loading them if problems occur.

11) Programs under 10 lines can be included in the text. If your program is longer than this you must enclose a disk or cassette.

12) If your article needs any artwork then supply clear examples of what is needed. We don't expect you to be an artist but we do need to see what is required.

13) Photographs, if necessary, must be either black and white prints or colour slides. We can take shots ourselves so don't worry about this too much.

14) Submissions of any length are welcome. If you have a five line routine that you think may be of use to someone else we welcome it just as much as a full blown six part series.

15) Payment varies quite a lot and depends on quite a number of factors, such as complexity of program, presentation of program, number of magazine pages it takes up etc. Payment is generally between £10.00 and £800.00.

16) All payments are made in the month that the magazine containing your article has appeared in print.

17) If we do find your submission suitable for inclusion in the magazine we will write to you giving the terms of publication, the rate of payment and an agreement form. Prompt return of this form will allow us to use your program as soon as possible.

18) If you want the program returning to you, should we find it unsuitable for publication, then you should enclose a stamped self addressed envelope.

19) The last and most important point to make is 'get writing', we are waiting for your articles. YC

Evesham Micros

ALWAYS A STEP AHEAD

DOUBLER

The tape back up "device"

Doubler has been an **enormous success** and continues to sell very well. Why? Because it is the **best product of its type** on the market. Doubler uses a unique method that copies **all types of software** regardless of speed. It consists of **hardware and software**. The software is the key part as unlike other products of its type Doubler creates a **brand new machine copy**. It is very easy to use and very successful. In fact our tests **have proved** that this "device" can achieve **100% success**.

Requires access to two data recorders.

ONLY £12.95

Why settle for less—this is the best.

ALIGNMENT PROBLEMS?

1541 PHYSICAL EXAM

£39.95

The program includes a digital alignment disc and software which allows you to **accurately check and correct** disc drive alignment. The instruction booklet is **very detailed**. Also includes quiet drive stops to **stop** that "hammering" thus preventing further problems.

ONLY £39.95

NEW MK.III VERSION

FREEZE FRAME

THE BEST IN BACKUP METHODS IS NOW EVEN BETTER

NOW HANDLES PROGRAMS THAT LOAD SUBSEQUENT PARTS

"Freeze Frame MKII" must have been the **world's most powerful and most successful** backup product. The success of "Freeze Frame" spawned several imitators but they are pale imitations of, what we are convinced, is the **most advanced and easy to use backup product in the entire world.**

Now the **"MKIII" version** has moved "Freeze Frame" well ahead of the "opposition". As well as its unfailing skill in handling **every memory resident program** available for testing up to 1st July 1986 it will now transfer from tape to disc the vast majority of **programs that load subsequent parts.**

FEATURES

- TAPE TO DISC
- DISC TO DISC
- COMPLETELY SELF CONTAINED, NO EXTRA SOFTWARE NEEDED
- FILES COMPRESSED FOR ECONOMY OF STORAGE SPACE
- 128/128D COMPATIBLE IN 64 MODE
- TAPE TO TAPE
- DISC TO TAPE
- RELOAD INDEPENDENT OF THE CARTRIDGE
- NOW HANDLES PROGRAMS THAT LOAD EXTRA PARTS
- PROGRAMS RESTART FROM THE POINT BUTTON IS PRESSED

OPERATING "FREEZE FRAME"

"Freeze Frame" is **simplicity itself** to use. It is cartridge based so is simply plugged into the cartridge port. When the computer is switched on a message is displayed, pressing "RETURN" will clear the computer back to the normal start up screen. Software can now be loaded from tape or disc **completely as normal.** The latest version of "Freeze Frame" will, to the best of our knowledge, allow **ANY software** to load and run normally (unlike competitive products).

"Freeze Frame" can be brought into operation at any convenient point by **pressing the button** on it. You can then do one of three things:—

1. **Pressing "D" will save a working version of the program in memory to a formatted disc. This version will include an auto booting very high speed reload (many programs reload in less than 30 secs).**
2. **Pressing "S" will save to disc with a standard reload speed that can be used by non 1541/70/71 drives U.S. spec. machines, etc., but perhaps more importantly by most fast load cartridges and systems. Use "Dolphin DOS" to reload anything in less than 10 secs. (Also suitable for U.S. spec. machines.)**
3. **Pressing "T" will save a working version of the program in memory to tape. This incorporates a high speed reload at approx. 2400 baud.**

IT'S AS SIMPLE AS THAT

ALL PROGRAMS SAVED WITH "FREEZE FRAME" CAN BE RELOADED INDEPENDANTLY OF THE UTILITY

ONLY £39.95

Owners of earlier versions can return them and upgrade for £14.95.

SERIOUS WARNING: THIS IS AN EXTREMELY POWERFUL PRODUCT AND IS STRICTLY FOR PERSONAL USE. DON'T COMPARE IT WITH ANY OTHER PRODUCT, NOTHING ELSE OFFERS THE POWER OF "FREEZE FRAME".

Quickdisc+

FAST LOAD PLUS UTILITY CARTRIDGE

After enjoying considerable success since its release we have now made some improvements to "QUICKDISC+" to maintain its position as the best value in the disc "speed up/utility" cartridges.

Fast LOAD (now 5-7 times normal speed). Works with majority of protected software. Can be switched in and out from the keyboard.

Fast SAVE at 7 times normal speed.

Fast Format takes just 20 seconds.

Fast Backup copies an entire disc in four minutes (not protected software).

Very Fast File Copier for selective file copying at HIGH speed. Now handles files up to **248 blocks** long.

Improved DOS commands (DOS 5.1) makes for easy use of the disc drive. eg. $(RETURN) will LOAD and display a directory without overwriting BASIC. SHIFT RUN/STOP will LOAD "0:*",8,1 etc. **Very, very useful.**

Incorporates Centronics printer software (user port) **with CBM graphics** capability (requires user port centronics cable).

A RESET switch is fitted. (We have found this to be "unstoppable", it even preserves the tape buffer).

NO MEMORY IS USED by this cartridge, it is totally "transparent" and uses special switching techniques.

"128" and 1570 compatible in '64 mode.

PLUS MANY MORE USEFUL FEATURES TO MAKE YOUR 1541 FAR MORE FRIENDLY TO OPERATE.

ONLY £19.95

When reviewing "Quickdisc+" Commodore Horizons said: **"A MUST FOR EVERY 1541 OWNER".**

NOW EVEN FASTER

DISC DISECTOR V5.0

Disc-Disector

Now the **FIFTH generation** of the country's **leading** disc back-up/utility package is available. This latest version includes **many more "PARAMETERS" to handle the latest highly protected discs.**

"EVESHAM 3 MINUTE NIBBLER" is the **latest version** of the infamous "Evesham Nibbler" now boasting **even more power and speed. Will now copy even the most highly protected discs in 3-4 minutes.** Handles the latest types of disc protection **completely automatically.** This often involves the use of the **"PARAMETER COPIER"** which adds the vital secret code that the highly protected programs check for (This is the important difference that makes this the best). At the time of going to press this program copied **virtually every disc program available for testing including the latest in games and business software.**

"DUAL DRIVE NIBBLER" allows the use of two drives to make **even faster back-ups.** Incorporates device number change software so no hardware mods necessary.

"NOVA TRANSFER" will **transfer to disc** the latest Nova Load programs including **multi part loaders.** A very useful utility that also includes routines to transfer "Summer Games II" and "Beach-Head II" to disc.

"DISCO" will transfer standard speed load software to disc.

"TRANS QD" allows you to save a fast load system to your own discs.

"DOUBLE BACK UP" is a **very fast** two drive back up.

As well as these important newcomers all the old favourite utilities which have helped earn "Disector" such a large following are included. These include **Menu Maker (selective), Fast Format, Unscratch, Disc Monitor, Disc Orderly, Fast File Copy, Index, etc., etc.**

The whole package is menu driven and has its own fast boot system built in for your convenience. Pays for itself the first day you receive it.

ONLY £29.95

Customers with earlier versions may return them along with a payment of £9.95 to receive V5.0

Programs are CBM 128 and 1570/71 compatible in '64 mode.

QUIET DRIVE STOPS

This package incorporates new drive stops for **two 1541s** that will **end for good** the dreaded "woodpecker". The fitting process is very easy and a test program is provided to check the fitment. Helps prevent future alignment problems and makes your drive purr with satisfaction.

ONLY £4.95

ODDS AND ENDS

STAR NL10C The best Commodore ready printer, many features including 120cps draft mode, 27cps near letter quality, tractor and friction feed with semi automatic single sheet feed, most functions front panel switch selectable but perhaps most importantly the **interface cartridge is replaceable.** So if you change to another make of computer you simply purchase a new interface to suit. **ONLY £269.00**

DISC NOTCHER Allows you to easily cut a second write protect notch in your discs so that you can use both sides. A very useful gadget. **ONLY £6.95**

AZIMATE 3000 Lets you realign the head of your data cassette quickly and easily. Supplied with suitable screwdriver. **ONLY £6.95**

3M DISKETTES The best quality discs, available from us at the price of cheap ones. Buy the best, they last a lifetime. Boxes of ten—

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DOUBLE SIDE/DOUBLE DENSITY	**£13.95**
OR PACKED IN A PLASTIC LIBRARY CASE	
SINGLE SIDE/DOUBLE DENSITY	**£12.95**
DOUBLE SIDE/DOUBLE DENSITY	**£14.95**

COMMODORE COMPATIBLE DATA RECORDER Performs the same operations as the C2N or 1531 but a useful saving. Also includes a pause button (if for use with C16/PLUS4 please state) **ONLY £29.95**

AND THEN THERE WAS DOLPHIN DOS

THE DIFFERENCE IS *STAGGERING*

Like everyone that has had the pleasure of seeing this system in operation you will be amazed by both the speed and ease of use. It is compatible with the majority of commercial software, speeding up both the program loading and SEQ/REL files.

Fitting requires the insertion of two sub assembly boards, one in the 1541 and one in the '64/'128. This does not normally entail soldering, although a small amount will be necessary with some machines.

ONLY £69.95

If you require further information please send SAE for fact sheet.

Operates with the CBM 64 or 128 in '64 mode with 1541 disc drive.

THE FEATURES

25x FASTER LOADING (PROGRAM FILES)
12x FASTER SAVING (PROGRAM FILES)
10x FASTER LOADING (SEQUENTIAL FILES)
8x FASTER SAVING (SEQUENTIAL FILES)
3x FASTER LOAD AND SAVE (RELATIVE)
(These figures do not allow for searching)
Easy DOS commands from function keys.
Fast formats 40 tracks giving 749 blocks free.
Centronics driver software inbuilt.
Machine code monitor.
Can be switched out if necessary.

SUBJECT TO AVAILABILITY. ALL ORDERS DESPATCHED THE WORKING DAY AFTER RECEIPT

All prices include P&P and VAT. Send cheque, Postal Order or Credit Card No. Credit Card orders accepted by phone. Callers welcome. Wide range of goods stocked. Trade enquiries welcome. European orders send price as advertised. Outside Europe £2.00 for airmail. Mail order to Evesham please.

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Tel: 021-458 4564

In Australia contact: **MICRO ACCESSORIES of S.A.,** 39b Anderson Walk, Smithfield, South Australia 5114. Tel: (08) 254 6284

Letters

Your comments on Your Commodore and everything else about computers.

Masterful

I have recently obtained a C64 and games are so dearl that I switched to buying Mastertronic Software.

I have many titles (*Finders Keepers, Spooks, Zzzz, Kikstart, Master of Magic, Ice Palace,* to name but a few) and the quality of them is superb, great instructions, brilliantly designed inlay cards, not forgetting the game quality itself. You get all this for the budget price of £1.99.

I think that Mastertronic deserve a medal for the games they produce.

Darren Kimber, Portsmouth

Praise indeed, Darren. Ever thought of a job in PR? Anyone else got a bee in their bonnet about a software house?

CP/Mystery

I have a C128 but at the moment the CP/M mode is used very little, as I find it hard to see any programs for it. When will the software houses bring out databases, wordprocessors and spreadsheets for it. If they have please tell me who they are.

Could you run a monthly page for the CP/M, please, to help us understand it better? I'm glad to see that more 128 programs are now in *Your Commodore*, excellent!

Lastly, What does CP/M stand for?

David M. Thornton, Dundee

CP/M stands for Control Program for Microprocessors. Not very helpful is it? It's basically a system to make file handling on disk a lot simpler. There are several thousand CP/M programs available (it's been going since 1975). Try Softworld, 5-7 Forlease Road, Maidenhead, Berkshire SL6 1RP (tel 0628 75573) for further details. Watch future issues for our forthcoming series on CP/M.

Net Profits

Your regular reports on the latest from Compunet and Micronet in Communications Corner has sufficiently whetted my appetite to become involved in the world of communications.

I have a C64 and I wish to buy a modem to use with it. Please could you tell me if a Commodore modem can access Micronet as well as Compunet? Also, are there any other modems available, apart from Commodore's which are capable of accessing Compunet?

Before I go, I would just like to say thank you for producing such a brilliant mag – it's the only one on the market which has interesting and informative articles and reviews, and it's well worth the money.

N J Adams, Dorchester

The Commodore modem is the only one which will give you access to Compunet and Micronet. Before you dash out and buy one, cast an eye over our Club 128 special offer (it's for C64 users as well, you know). Thanks for the kind words and keep pounding the magazine!

Sweet C16?

I bought a new Commodore 16 but I now find that I can't get magazines for it. Tell me why one can't get magazines for the C16?

I have looked from shop to shop, also from town to town. I feel that I should have been advised when I first bought the Commodore Starter Pack.

Rhydwyn Jones, Rhyll

Please could you inform me if Argus has a computer magazine for the C16? I feel the overpriced Your Commodore really is a waste of time for my requirements with only a handful of pages in each edition. My view saying overpriced only means that nearly all the mag is useless for me and probably all other C16 users.

I have purchased Your Commodore for five months and have found it far superior to ANY other computer mag (e.g. Commodore User). If a separate magazine could be introduced for C16 owners it would fill a large hole in the Commodore market.

Please tell my story to your readers and see what other C16 owners feel... INTRODUCE YOUR COMMODORE C16.

Kevin McBride, Lostock Hall

The problem with producing a C16 magazine is principally one of finance. The user base is not large enough to support a dedicated magazine. I know many readers feel that the C stands for Cinderella but we are doing our best to ensure that you get the support you need but we also have a growing family of ugly sisters to support.

Build-a-Tape

In Your Commodore, March 86 issue, you started the software service. Would it be possible to publish 'Build A Better Basic' on cassette tape since it is an extremely long utility to type in?

Graham Blissett, Kempshott

Sorry, Graham, we don't have the Rights to allow us to do this. You'll have to risk the blisters and hack it in yourself.

SYS Ease

At present I own a Vic 20+16K switchable RAM pack, but I will be getting a C128 soon. My question is how can I get a small character to run across the bottom of the screen by telling a part of the programme to SYS this.

I know how to do a small programme in Basic to do this but I just don't know how to use the SYS command and I don't understand machine code. So please could you help me without being too complicated.

Could you also give me some advise on a good machine code teaching book, or aid, which is easy to understand and doesn't cost an arm or a leg.

C P McGowan, Kennington

Sorry CP, if you don't understand machine code the SYS command is of no great use to you. All it does is act like a GOSUB but it's a GOSUB into a machine code program. To help you you might like to try the DR Watson C64 Assembly Language Course from Honeyfold, Bath Place, Barnet, London. They ask me to point out that they don't accept severed limbs as legal tender. You could also give our Welcome to the Machine series the once over.

Review Blues

While writing for your 'Utility Cassette', I thought a small note was in order.

I am very impressed with your magazine and the only reason I haven't subscribed is the trend other magazines have taken – game reviews! Page after page of them. Please let the other 'magazines' deal with these.

The best layout for me would be documentary and original assembly/Basic listing for large programs with a monthly cassette and smaller type-in programs to amuse – of course this is a personal view.

Otherwise, your choice of topics are interesting and varied and at the moment *Your Commodore* is the only magazine worth buying. Please don't slip.

K C Humphrey, Hulme

It's nice to feel wanted. We have noted the trend towards the lowest common denominator in the micro world and, as you can see, it is not a path we wish to tread. We do have games reviews but these are part of our philosophy that all work and no play...

Since your ideal describes our magazine so accurately and we promise not to slip, we look forward to receiving your subscription in the near future.

Mathematics

I am taking a BTEC National Diploma in Computer Studies and I am stuck for a MAT function on my home micro, a C64. Is there any one out there in computerland who can help me with a machine code program which will do matrices on the C64.

I realise this might be too tall an order but I hope that someone out there is clever enough to help me out. I need the MAT function for the Quantitative Methods section of the course.

James Strang, Droylsden

Any offers? Please send them to our Golden Square address and we will pass them on. YC

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Commodore 128D inc. Built-in 1571 Disk Drive + 1900 Mon	495.00
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Philips BM7502 Green 12" Composite video & sound	69.00
Philips 8500 Col. 14" Std Res for C64 inc. lead	176.00

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Commodore 1571 Disk Drive	226.00
Cent Interface for C64/128	26.04
Cent Interface for C64/128 with 8k buf & graphics	51.30
Commodore 64 Compatible Power Supply	21.70
Commodore 64/128 Compatible Cassette Recorder	21.70
Surge Protector 13 Amp Plug	10.39
The Final Cartridge Operating System	37.39
C64 Programmer's Ref Guide	7.95
The Anatomy of a Commodore 64	5.95
Machine Language Book for the C64	5.95
Printer Ribbons - You name it	P.O.A

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64 SOURCE CODE GENERATOR. Converts any M/C program to TRUE source code with labels. DISASEMBLES from memory to memory, APPENDS, RENUMBERS, DELETES, allows changes in the START OF BASIC and EXIT TO BASIC for LOADS and SAVES. Disk version also gives START AND END ADDRESS OF A PROGRAM.

EASY BASIC – The best enhancement to basic you could possibly want with over 25 functions on tape version and over 30 on the disk version. Too many to list them all but include — RENO, renumber, REPE, repeats defined key: FKEY, program function key: NUMB, auto line numbering; TSAV or DSAV for savers; UNNE, restores programs deleted using NEW, and many more
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TRACKER	£19.95	£37	£66
MIMIC FLIP SIDED	£22.95	£43	£78

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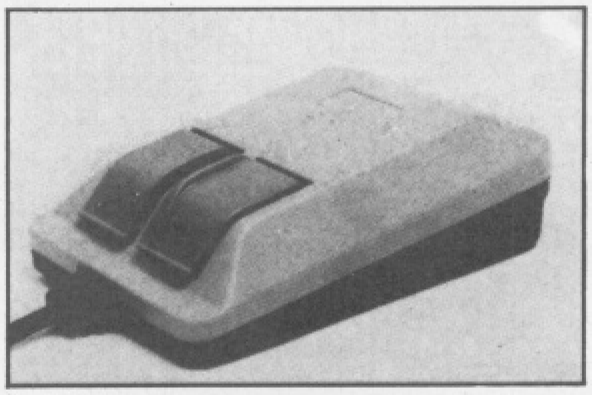
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MS2000/NEOS MOUSE

★ FASTER INTERACTION ★ CREATIVE GRAPHICS ★ ICON SOFTWARE ★ STUNNING PACKAGES

Mice are tops for cursor control peripherals because of their speed, comfort, friendliness and accuracy. This is the top Commodore mouse with optical encoding and 100 points to inch resolution.

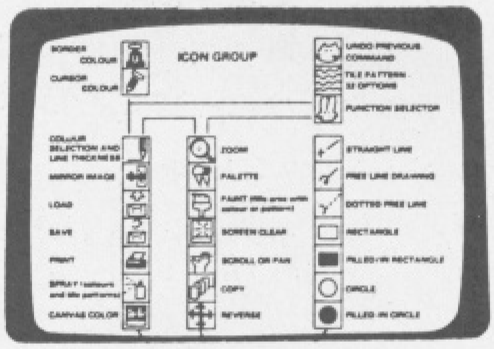
CBM 64/128



Art Graphics Design Cad Drawing Business

Commodore Horizons "Certainly the best mouse for the 64"

16 Colour package



Command and Control

WOW! **Mouse + "Cheese" Cassette = only £47.40**

NEW! **ARTIST 64 Mouse or Joystick**

This is the most sophisticated, powerful and advanced art or graphics package available on a CBM 64 or 128. The BBC version was reviewed as "powers undreamed of" and "finest graphics aid I have ever seen". NOW — available on CBM on cassette or disc. Takes over where cheese leaves off. Although friendly and fun — can be used professionally with over 250,000 combinations of commands.

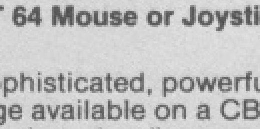
★GIVE YOUR 64/128 — AMIGA TYPE GRAPHICS★ Full colour working. Full screen working. Zoom and Pan. Create any brush, fill, pattern or icon. Variable Text. Commodore and Epson printdumps. Add other print routines. Innovative colour commands. "Over and Under" — (Colours weave over and under each other) "Colour Cycling" "Duplicate objects without certain colours." See C.C.I. Review Oct. 86.

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C64 Autosave

One of the most enduring problems which programmers face is the loss of hours of work through human or computer error. With this program you'll be able to save time and a lot of frustration.

By Paul Eves

You are busy typing in your mega adventure game in Basic. You have been typing for over an hour and decide that at the end of the next line, you will save out your work. Suddenly, a quick power surge resets your 64 and you are left with nothing. (Unless of course you happen to have an OLD program sat somewhere in memory – and how many of us bother to do that.)

That's just one of the hazards of Basic programming. Hopefully, this little program will come to your rescue.

Before you start typing your Basic program in, load up my AUTOSAVE program first. Type NEW then activate with SYS52480. Now you don't have to worry about continually stopping to save out your work. Every five minutes your work will be saved out automatically, under the name of PROGRAM. Once the program has been saved control is returned back to you, as if nothing had happened. Just prior to the SAVE, you will hear a warning tone, this is so that you can stop typing whatever you're typing and wait for the SAVE. So how does the program work?

As you know, over sixtieth of a second the CPU stops whatever it's doing and scans the keyboard and STOP key. Luckily for us, the vector that points to the interrupt routine lies in RAM. This means, of course, that we can change the vector address to our own address. Therefore, every sixtieth of a second the machine will do what we want it to do before executing its own interrupt routine.

And how do we do that?

The first thing we must do is disable the normal interrupts so that we can change the vector address. If we neglected to do this, the machine would cause an interrupt within an interrupt and just lock up. After changing the vector to point our own routine, we then re-enable the interrupts. The machine will now stop over sixtieth of a second, perform our amended interrupt, then continue with the normal interrupt.

So, what is our new routine? Firstly, we count down within a loop for five minutes. (I could quite easily have used the system clock under interrupt for this, but this way is shorter and neater.) If it's less than five minutes then the routine breaks out to the normal keyboard scan interrupt routine at $EA31.

Once the countdown has reached the five minute mark the routine jumps to the warning tone routine. Here our friend SID performs three short beeps before jumping to the save routine. The screen is then cleared and the KERNAL routines SETLFS, SETNAM and SAVE are called one by one. To make the program flow easier to follow, I have incorporated a name save for both TAPE and DISK. (Obviously, tapes don't need a name in reality). After the save, the interrupts are set back to our routine once again and away the program goes.

Naturally the program could be expanded to incorporate a number of things. For example, you could have a LIST or a LOAD command put on to the F keys as well as the forced save. Obviously the more things that your interrupt has to perform, the slower the program becomes. (And it's not really good practice to rely too heavily on interrupts.)

I must say that I've found this program very helpful indeed. I just hope you'll get as much use out of it as I have. YC

PROGRAM: AUTOSAVE

Please read 'LISTINGS'
before entering program.

```
CE  10 I=52480:D=0
F4  20 READ A:IF A=256 THEN35
F8  30 POKE I,A:I=I+1:D=D+A:GOTO
     20
83  35 IFD<>57800THENPRINT"DATA
    ERROR!":END
65  40 SYS52480
C9  52480 DATA 162,0,160,11,142,
    32,208,140
92  52488 DATA 33,208,232,142,13
    4,2,202,189
7C  52496 DATA 5,206,32,210,255,
    232,224,255
E2  52504 DATA 208,245,162,0,189
    ,4,207,32
11  52512 DATA 210,255,232,224,3
    8,208,245,162
7C  52520 DATA 0,189,42,207,32,2
    10,255,232
F3  52528 DATA 224,24,208,245,32
    ,228,255,201
3C  52536 DATA 84,240,7,201,68,2
    40,3,76
B6  52544 DATA 52,205,133,254,16
    9,13,32,210
5C  52552 DATA 255,169,71,133,25
    1,133,252,120
D1  52560 DATA 169,94,160,205,14
    1,20,3,140
5B  52568 DATA 21,3,88,76,116,16
    4,165,197
19  52576 DATA 201,4,240,11,198,
    251,208,4
26  52584 DATA 198,252,240,3,76,
    49,234,120
69  52592 DATA 169,49,141,20,3,1
    69,234,141
A2  52600 DATA 21,3,88,32,240,20
    5,169,0
CD  52608 DATA 162,24,157,0,212,
    202,16,250
61  52616 DATA 169,5,141,4,206,1
    69,15,141
D7  52624 DATA 24,212,169,17,141
    ,5,212,169
8E  52632 DATA 248,141,6,212,169
    ,50,141,0
3D  52640 DATA 212,141,1,212,169
    ,17,141,4
C2  52648 DATA 212,162,255,160,1
    00,136,208,253
49  52656 DATA 202,208,250,169,1
    6,141,4,212
F3  52664 DATA 206,4,206,208,213
    ,169,5,141
5C  52672 DATA 4,206,169,147,32,
    210,255,165
33  52680 DATA 254,201,84,240,5,
    162,8,76
B8  52688 DATA 212,205,162,1,32,
    186,255,169
5D  52696 DATA 9,162,251,160,205
    ,32,189,255
7B  52704 DATA 32,89,225,162,255
    ,160,255,202
F5  52712 DATA 208,253,136,208,2
    50,76,73,205
A6  52720 DATA 162,255,160,255,2
    02,208,253,136
55  52728 DATA 208,250,96,64,58,
    80,82,79
C3  52736 DATA 71,82,65,77,0,147
    ,13,32
7F  52744 DATA 32,65,85,84,79,32
    ,83,65
47  52752 DATA 86,69,32,80,82,79
    ,71,82
83  52760 DATA 65,77,32,45,32,66
    ,89,32
41  52768 DATA 80,65,85,76,32,65
    ,46,32
6E  52776 DATA 69,86,69,83,13,17
    ,32,65
9C  52784 DATA 85,84,79,77,65,84
    ,73,67
70  52792 DATA 65,76,76,89,32,83
    ,65,86
7C  52800 DATA 69,83,32,79,85,84
    ,32,66
39  52808 DATA 65,83,73,67,32,80
    ,82,79
7C  52816 DATA 71,82,65,77,83,13
    ,69,86
93  52824 DATA 69,82,89,32,53,32
    ,77,73
D0  52832 DATA 78,85,84,69,83,46
    ,91,85
E6  52840 DATA 78,68,69,82,32,84
    ,72,69
FC  52848 DATA 32,78,65,77,69,32
    ,80,82
F8  52856 DATA 79,71,82,65,77,93
    ,32,65
60  52864 DATA 32,87,65,82,78,73
    ,78,71
BE  52872 DATA 32,84,79,78,69,32
```

```
      ,87,73
BD  52880 DATA 76,76,32,83,79,85
      ,78,68
C9  52888 DATA 32,80,82,73,79,82
      ,32,84
1E  52896 DATA 79,32,84,72,69,13
      ,83,65
84  52904 DATA 86,69,32,45,32,84
      ,72,73
80  52912 DATA 83,32,87,73,76,76
      ,32,69
5B  52920 DATA 78,65,66,76,69,32
      ,89,79
C9  52928 DATA 85,32,84,79,32,83
      ,84,79
1B  52936 DATA 80,32,89,79,85,82
      ,84,89
11  52944 DATA 80,73,78,71,32,66
      ,69,70
4A  52952 DATA 79,82,69,32,84,72
      ,69,32
66  52960 DATA 83,65,86,69,32,67
      ,79,77
38  52968 DATA 77,69,78,67,69,83
      ,46,13
B6  52976 DATA 91,78,69,87,93,32
      ,66,69
30  52984 DATA 70,79,82,69,32,83
      ,84,65
C3  52992 DATA 82,84,32,13,80,82
      ,69,83
8A  53000 DATA 83,73,78,71,32,70
      ,49,32
65  53008 DATA 65,78,89,84,73,77
      ,69,32
D7  53016 DATA 87,73,76,76,32,70
      ,79,82
8F  53024 DATA 67,69,32,65,32,83
      ,65,86
07  53032 DATA 69,13,65,83,83,73
      ,71,78
F7  53040 DATA 32,68,69,86,73,67
      ,69,32
33  53048 DATA 40,84,32,79,82,32
      ,68,41
D6  53056 DATA 32,32,32,256
```

Datamaker

Turn your machine code into Data with these two programs from M. Catley and K. Otton.

Unless you have access to an assembler entering machine code data is a real problem. Since machine code is simply a series of numbers, entering them into your computer leads to all sorts of errors, resulting in your program's total inability to functions.

Your Commodore uses Basic loaders to help people to enter machine code programs from the magazines. These Basic loaders hold the numbers that make up the machine code program in a line of data, the last number being a checksum. The Loader program when RUN, reads the DATA into memory, adding each number together, then the total of each line is compared with its checksum, if they are not the same then you have done something wrong.

In the March 1986 issue of *Your Commodore* we printed a Basic program for the 64 (Datamaker) that would read a machine code file from disk and generate a machine code program. This worked fine except for a couple of small problems. Firstly the program was very slow. Secondly, you had to have a disk drive to use it.

With this article we are printing two new machine code to data statement conversion programs. One of them is for the C64 but this time the program is written in machine code and will now take machine code from memory as well as from disk. The second program is for the C128, this program isn't quite as fast as the one for the C64 but it does have the advantage that it generates its own SAVE routine at the end of the data so that, when RUN, the program will SAVE the machine code on to disk.

C64 Data Maker

As I mentioned earlier, this version of the data maker program is better than the old one. A further facility that has been added is an extra check in the loader program. If, in the old version of the program, you omitted a number from a line of DATA, the computer would read the checksum and try to POKE it into memory. Since the checksum is usually greater than 255 this resulted in an illegal quantity error in the line that held the POKE statement.

This new version of the program has a check that stops the program if the number to be POKEd into memory is greater than 255, giving the line from which the DATA was read, not the line of the POKE statement. As you can see this makes finding typing errors even easier.

The C64 Datamaker is presented here in the form of a Basic loader. In fact the program was used to make this loader.

As already mentioned this is a machine code file that should be LOADed and RUN at memory location 49152 ($C000 hex).

To start the program you enter the following commands:

```
NEW
SYS 49152
```

As soon as you press RETURN the screen will clear and a promt 'INSERT READER PROGRAM Y/N' will appear. If yes is selected the simple loader program shown in Figure 1 will be entered into memory.

Data maker will work out the last line of any program already in memory, add 10 to it and start its own numbering from there. This allows DATA statements to be added on to an existing program.

Once the reader has been entered or if no (N) was selected a second prompt 'SELECT DISK OR MEMORY' will be displayed.

If MEMORY is selected further prompts for start and end addresses will be displayed. These numbers may be entered in decimal or in hex by prefixing the number with a dollar sign.

If DISK is selected a filename will be requested.

Once the end has been reached Data Maker will insert the number of blocks, line number and memory start address into the reader part (only if the reader was entered of course.) It will then return to Basic with the READY prompt.

Data Maker 128

Data Maker 128 is a utility program for the C128 computer with a disk drive. The program will take any file, the SOURCE program, from the disk, convert it into DATA statements and write it back to the disk under a supplied filename, the TARGET program. You will also be requested to supply a START LINE NUMBER and an increment value for the DATA STATEMENTS. Twenty individual

FIGURE 1

```
10 BL=xx : LN=yy : SA=zz
20 FOR L=0 TO BL:CX=0:FORD=0TO15
30 READ A:IF A>255THENPRINT;LN+(
L*10):STOP
40 CX=CX+A:POKE SA+L*16+D,A:NEXT
D
50 READ A:IF A><CX THENPRINT;LN+
(L*10):STOP
60 NEXTL:END
```

DATA VALUES will be saved on each line, followed by a computer checksum. All values are in HEX.

On completion of the conversion of the program the Data Maker will save a LOADER on to the end of the TARGET program so that when LOADed it is ready to RUN.

Whilst the program is running, it will display the DISK ERROR CHANNEL, the ADDRESS being read, and the BYTE value of the contents of that address. This tends to slow down the program slightly, but was considered necessary as it can be a lengthy process to convert a long machine code program into data statements, and one could think the program had crashed. For the same reason, the loader put on to the end of the target program will display both the ADDRESS being processed and the BYTE being POKEd into that address. After RUNning the TARGET program, a filename will be requested. This is the name under which the loader will save the assembled program to disk.

The new program, TARGET, is now ready for use. Simply LOAD it into a C128 and type RUN. The machine code then be POKED into memory and SAVEd on to disk as a machine code file, i.e. the same as the original SOURCE program.

Hints and Tips

For some time we have been using Basic loaders for most of our machine code programs in *Your Commodore*. Inevitably we have of course come across some problems and below you will find some little tricks that we use to overcome these difficulties.

Quite often the program that we wish to convert from machine code to DATA statements is too big to fit in the computer's memory at once. Obviously this is more likely to be a problem for C64 owners than those using a C128 since more memory is available on the C128.

Quite often the program that we wish to convert from machine code to DATA statements is too big to fit in the computer's memory at once. Obviously this is more likely to be a problem for C64 owners than those using a C128 since more memory is available on the C128.

When the program is too big you will have to split it into segments. To do this you will require access to a machine code monitor, C128 owners have one built in, C64 owners will have to LOAD One or use one from many of the cartridges that are available.

Before you can split the program you will of course have to know the START ADDRESS and END ADDRESS of the machine code program.

Use the S command in the monitor to SAVE your program into a number of equal parts. Then use the Data Maker programs to change each part into separate Basic loaders.

When you want to use the machine code program generated by the DATA statements you will have to LOAD each of the Basic loaders into your computer one at a time and RUN them. If you want to get a little clever you can put an auto load at the end of each of the programs. Figure 2 gives an example of the type of loader that we use in *Your Commodore*. The program breaks down as follows.

Line 5000 prints the keyword 'NEW' and the command LOAD FILE,8,1 on to the screen.

Line 5010 prints the keyword 'RUN', four lines further down the screen.

Line 5020 POKES three carriage returns into the keyboard buffer which starts at location 631. The number of characters in the keyboard buffer is then POKEd into memory location 198. This location is the counter for the number of characters in the keyboard buffer. The cursor is then moved to the top of the screen and the program ends.

Because there is a RETURN in the keyboard buffer the computer thinks that you have typed the keyword NEW and erases the program. The next RETURN in the buffer makes the

Data Maker C128

```
 10PRINT"[CLEAR][YELLOW][DOWN2]"
:COLOR0,1:COLOR4,1:GOTO1000
 20:
 200PRINT#2,CHR$(1)CHR$(28);:RET
URN
 210:
 300T=INT(LN/256):PRINT#2,CHR$(1
)CHR$(28)CHR$(LN-T*256)CHR$(T)CH
R$(131)" ";
 310LN=LN+PL:RETURN
 320:
 400BY$=RIGHT$(HEX$(BY),2):SUM=S
UM+BY:PRINT#2,BY$",";:RETURN
 410:
 500SU$=HEX$(SUM):SUM=0:PRINT#2,
SU$CHR$(0);:RETURN
 510:
 1000INPUT"[SPC3]SOURCE PROGRAM:
";NS$:INPUT"[DOWN3][SPC3]TARGET
PROGRAM:";NT$
 1010INPUT"[DOWN3]START LINE NUM
BER[SPC3]10[LEFT4]";LN$:LN=VAL(L
N$)
 1020INPUT"[DOWN3][SPC8]INCREMEN
T[SPC3]10[LEFT4]";PL$:PL=VAL(PL$
)
 1030DOPEN#1,(NS$)+",P":IFDSTHEN
PRINT"[CLEAR][C6]DISK ERROR "DS$
:DCLOSE:END
 1040DOPEN#2,(NT$)+",P",W:IFDSTH
ENPRINT"[CLEAR][C6]DISK ERROR "D
S$:DCLOSE:END
 1050:
 2000GOSUB200:SUM=LN:GOSUB300:GE
T#1,A$:GET#1,B$
 2010LOC=ASC(A$)+256*ASC(B$):SUM
=LOC:GOSUB500
 2020:
 3000CHAR1,0,20,"[SPC6]DISK[SPC2
]STATUS[SPC4]ADDR[SPC4]BYTE[SPC6
]",1
 3010DO:GOSUB300:FORJ=0TO19
 3020LOC=LOC+1:GET#1,A$:BY=ASC(A
$+CHR$(0)):IFSTTHENEXIT
 3030CHAR1,0,22,"[SPC6]"+DS$+"[S
PC4]"+HEX$(LOC)+"[SPC5]"+RIGHT$(
HEX$(BY),2),0
 3040GOSUB400:NEXT:GOSUB500:LOOP
:DCLOSE#1:PRINT"[CLEAR]"
 3050:
 4000CHAR1,0,22,"FINISHED READIN
G DISK...[SPC2]WRITING LOADER"
 4010BY=0:FORI=JTO19:GOSUB400:NE
XT
 4020GOSUB500:GOSUB300:PRINT#2,"
END"CHR$(0);
 4030FORJ=0TO319:READBY$:BY=DEC(
BY$):PRINT#2,CHR$(BY);:NEXT
 4040DCLOSE#2:PRINT"[CLEAR]":END
 4050:
 5000DATA 4B,1C,FB,F9,99,22,93,2
2,3A,E7,30,2C,31,3A,E7,34,2C,31,
3A,E0
 5010DATA 31,2C,31,30,2C,31,32,2
C,22,9E,57,4F,52,4B,49,4E,47,2E,
2E,2E
 5020DATA 2E,24,22,2C,31,3A,E0,3
1,2C,31,34,2C,31,34,2C,22,50,4C,
45,41
 5030DATA 53,45,20,20,57,41,49,5
4,22,2C,31,3A,8C,00,71,1C,FC,F9,
87,41
 5040DATA 24,3A,53,B2,D1,28,41,2
4,29,3A,45,B2,53,3A,EB,3A,87,42,
24,3A
 5050DATA 8B,42,24,B2,22,45,4E,4
4,22,A7,ED,00,B3,1C,FD,F9,53,55,
B2,30
 5060DATA 3A,81,4A,B2,30,A4,31,3
9,3A,42,B2,D1,28,42,24,29,3A,97,
45,AA
 5070DATA 4A,2C,42,3A,53,55,B2,5
3,55,AA,42,3A,E0,31,2C,32,32,2C,
31,32
 5080DATA 2C,D2,28,45,AA,4A,29,A
A,22,3D,24,22,AA,42,24,2C,31,00,
FD,1C
 5090DATA FE,F9,87,42,24,3A,82,3
A,45,B2,45,AA,32,30,3A,8B,53,55,
B3,B1
 5100DATA D1,28,42,24,29,A7,99,2
2,93,11,11,11,11,11,96,44,41,54,
41,20
 5110DATA 45,52,52,4F,52,20,49,4
E,20,4C,49,4E,45,22,C2,28,36,35,
29,AA
 5120DATA 32,35,36,AC,C2,28,36,3
6,29,3A,80,00,3F,1D,FF,F9,EC,3A,
85,22
 5130DATA 93,11,11,11,11,11,11,4
6,49,4C,45,4E,41,4D,45,20,4F,46,
20,54
 5140DATA 41,52,47,45,54,20,46,4
9,4C,45,3A,22,3B,4E,24,3A,FE,10,
28,4E
 5150DATA 24,29,2C,42,30,2C,50,2
8,53,29,A4,50,28,45,29,3A,80,00,
00,00
```

computer think that you have typed LOAD FILE,8,1 so it will go off to the disk drive and LOAD the program called file. There is one carriage return left in the keyboard buffer. The cursor is now over the keyword RUN and when the RETURN is executed the computer thinks you have typed RUN. Simple isn't it?

If you are confused read the explanation again and play around with the program in FIGURE 2.

Quite often you will come across a program which when the loader for it is RUN, proceeds to POKE itself into the same memory locations as the loader program. This of course will not work. In order to overcome this problem you have to move the start of Basic so that the Loader program and the machine code will be at two different memory locations. Memory locations 43 and 44 (45 and 46 on the C128) hold the start of Basic. Location 43 holds the low byte off the address and location 44 holds the high byte. The following formulae can be used to work out the numbers to be POKED into the relevant memory locations:

LOW BYTE = ADDRESS - 256* INT (ADDRESS/256)
HIGH BYTE = INT (ADDRESS/256)

Where address is the memory location where you want Basic to start.

One further point worth raising is that the memory location before the start of Basic should always contain a zero. For example if you had moved Basic to memory location 2000, location 1999 should be POKEd with a zero.

Commodore 128 owners have an advantage over C64 owners when it comes to SAVEing a program, they have a machine code SAVE instruction in Basic 7.0 as well as the one in the monitor. C64 owners have to resort to POKEing into memory yet again.

We have already said that locations 43 and 44 hold the start of Basic. Memory locations 45 and 46 (47 and 48 on the C128) hold the memory address of the end of Basic. Whenever a SAVE is performed the computer looks at these memory loca-tions to see what area of memory it should SAVE to whatever device you are using. If you POKE these memory locations with the start address and end address of your machine code program you will be able to SAVE your code. The memory locations should be POKEd with the following values:

43 low byte of start address
44 high byte of start address
45 low byte of end address
46 high byte of end address

The formulae already given can be used to work out the numbers to be POKEd.

Of course, since you have moved Basic, you will not be able to list any programs in Basic memory until you reset the memory locations to their original values.

One more problem that you may come across is the fact that the machine code program to be turned into DATA statements sits at the same memory location as the Data Maker program. This will cause you no problems if you are using the disk option in the C64 program or the C128 program. However if you are using the C64 program with memory you cannot use it to create data for programs that sit around location 49152 as this is where the Data Maker program sits.

This article should give you all of the information that you require to use Basic loaders for machine code.

If you are thinking of sending a machine code program to the magazine it would be extremely useful if you would not only include the machine code source file on disk but also a series of loaders using either of the above programs. This means that the programs would be ready to print and save a lot of production time in the *Your Commodore* office. YC

Data Maker C64

```
PROGRAM: DATAMAKER-C64

Please read 'LISTINGS'
before entering program.

10   10 BL=145  :LN=70   :SA=4915
     2
F9   20 FOR L=0 TO BL:CX=0:FOR D=
     0 TO 15
9F   30 READ A:IF A>255THENPRINT"
     NUMBER TO LARGE";LN+(L*10):S
     TOP
28   40 CX=CX+A:POKE SA+L*16+D,A:
     NEXT D
A9   50 READ A:IF A><CX THENPRINT
     "ERROR IN LINE";LN+(L*10):ST
     OP
4C   60 NEXT L:END
A1   70 DATA 76,200,193,162,0,169
     ,46,32,210,255,232,224,5,208
     ,248,162,2422
64   80 DATA 0,169,157,32,210,255
     ,232,224,5,208,248,169,0,162
     ,0,157,2228
25   90 DATA 189,193,232,224,7,20
     8,248,32,228,255,208,38,169,
     60,32,210,2533
7C   100 DATA 255,169,157,32,210,
     255,173,195,193,201,5,240,13
     ,169,46,32,2345
12   110 DATA 210,255,169,157,32,
     210,255,76,39,192,169,32,32,
     210,255,76,2369
C3   120 DATA 66,192,201,13,240,1
     18,201,20,240,62,201,36,208,
     15,174,195,2182
70   130 DATA 193,224,0,208,194,1
     62,1,142,194,193,76,133,192,
     201,48,144,2305
F3   140 DATA 182,201,58,176,3,76
     ,133,192,174,194,193,240,170
     ,201,65,144,2402
B2   150 DATA 166,201,71,176,162,
     174,195,193,224,5,240,155,15
     7,189,193,32,2533
1C   160 DATA 210,255,238,195,193
     ,76,39,192,174,195,193,224,0
     ,208,8,162,2562
C7   170 DATA 0,142,194,193,76,39
     ,192,206,195,193,169,0,174,1
     95,193,157,2318
B5   180 DATA 189,193,169,157,32,
     210,255,169,46,32,210,255,16
     9,157,32,210,2485
1D   190 DATA 255,174,195,193,240
     ,3,76,39,192,76,159,192,173,
     189,193,240,2589
AE   200 DATA 7,201,36,208,5,76,5
     5,193,56,96,162,0,134,20,134
     ,21,1404
50   210 DATA 162,0,189,189,193,3
     2,241,192,232,236,195,193,20
     8,244,76,53,2635
0A   220 DATA 193,24,233,47,133,7
     ,165,21,133,34,201,25,176,33
     ;165,20,1610
FD   230 DATA 10,38,34,10,38,34,1
     01,20,133,20,165,34,101,21,1
     33,21,913
1C   240 DATA 6,20,38,21,165,20,1
     01,7,133,20,144,2,230,21,96,
     104,1128
D2   250 DATA 104,169,20,32,210,2
     55,32,210,255,32,210,255,32,
     210,255,32,2313
5D   260 DATA 210,255,76,3,192,24
     ,96,169,0,133,20,133,21,173,
     193,193,1891
4A   270 DATA 240,3,76,90,193,162
     ,3,189,189,193,157,190,193,2
     02,224,0,2304
BB   280 DATA 208,245,169,48,141,
     190,193,76,61,193,173,190,19
     3,141,196,193,2610
F0   290 DATA 173,191,193,141,197
     ,193,32,127,193,133,21,173,1
     92,193,141,196,2489
E9   300 DATA 193,173,193,193,141
     ,197,193,32,127,193,133,20,7
     6,53,193,234,2344
61   310 DATA 173,196,193,201,58,
     144,15,41,15,24,105,9,10,10,
     10,10,1214
3A   320 DATA 141,198,193,76,159,
     193,41,15,10,10,10,10,141,19
     8,193,173,1761
18   330 DATA 197,193,201,58,144,
     11,41,15,24,105,9,141,199,19
     3,76,182,1789
08   340 DATA 193,41,15,141,199,1
     93,173,199,193,13,198,193,96
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    ,56,53,48,2004
D3  350 DATA 0,0,0,3,67,54,192,6
    ,32,0,197,169,0,141,138,200,
    1199
A1  360 DATA 141,139,200,162,0,1
    89,143,200,240,7,32,210,255,
    232,76,213,2439
DD  370 DATA 193,32,228,255,240,
    251,201,89,208,11,32,222,198
    ,169,255,141,2725
EF  380 DATA 157,199,76,254,193,
    201,78,208,232,169,0,141,157
    ,199,162,0,2426
13  390 DATA 189,198,200,240,7,3
    2,210,255,232,76,0,194.32.22
    8,255,201,2549
4A  400 DATA 68,208,3,76,29,194,
    201,77,208,242,76,14,195,162
    ,16,32,1801
2C  410 DATA 234,197,173,142,200
    ,208,22,162,0,189,229,200,24
    0,7,32,210,2445
DC  420 DATA 255,232,76,41,194,3
    2,228,255,240,251,76,29,194,
    169,1,133,2406
0B  430 DATA 184,169,8,133,186,1
    69,0,133,185,173,142,200,133
    ,183,169,178,2345
26  440 DATA 133,187,169,200,133
    ,188,32,192,255,32,47,196,32
    ,220,197,162,2375
61  450 DATA 1,32,198,255,32,207
    ,255,141,19,201,32,207,255,1
    41,20,201,2197
68  460 DATA 173,157,199,240,3,3
    2,165,196,76,140,194,173,138
    ,200,24,105,2215
42  470 DATA 1,141,138,200,173,1
    39,200,105,0,141,139,200,169
    ,0,141,16,1903
DD  480 DATA 201,141,17,201,32,1
    54,197,169,16,141,18,201,32,
    207,255,141,2123
54  490 DATA 22,201,32,183,255,2
    08,44,173,22,201,24,109,16,2
    01,141,16,1848
D0  500 DATA 201,173,17,201,105,
    0,141,17,201,173,22,201,170,
    32,216,196,2066
DF  510 DATA 169,44,32,202,197,2
    06,18,201,173,18,201,208,207
    ,32,106,197,2211
05  520 DATA 76,123,194,173,18,2
    01,240,21,169,48,32,202,197,
    169,44,32,1939
42  530 DATA 202,197,206,18,201,
    173,18,201,208,238,32,106,19
    7,169,0,32,2198
D8  540 DATA 202,197,169,0,32,20
    2,197,165,251,133,45,165,252
    ,133,46,169,2358
E8  550 DATA 1,32,195,255,32,204
    ,255,32,51,165,32,109,198,96
    ,162,0,1819
B4  560 DATA 189,104,200,240,7,3
    2,210,255,232,76,16,195,32,3
    ,192,144,2127
7A  570 DATA 3,76,254,193,165,20
    ,141,19,201,133,65,165,21,14
    1,20,201,1818
AF  580 DATA 133,66,173,157,199,
    240,3,32,165,196,162,0,189,1
    21,200,240,2276
A2  590 DATA 7,32,210,255,232,76
    ,60,195,32,3,192,144,3,76,25
    4,193,1964
F7  600 DATA 165,20,141,140,200,
    165,21,141,141,200,173,141,2
    00,205,20,201,2274
80  610 DATA 240,5,144,170,76,11
    6,195,173,140,200,205,19,201
    ,240,159,176,2459
C8  620 DATA 3,76,14,195,32,220,
    197,76,139,195,173,138,200,2
    4,105,1,1788
00  630 DATA 141,138,200,173,139
    ,200,105,0,141,139,200,169,0
    ,141,16,201,2103
B1  640 DATA 141,17,201,32,154,1
    97,169,16,141,18,201,32,22,1
    96,176,47,1760
D2  650 DATA 32,2,196,141,22,201
    ,24,109,16,201,141,16,201,17
    3,17,201,1693
12  660 DATA 105,0,141,17,201,17
    3,22,201,170,32,216,196,169,
    44,32,202,1921
20  670 DATA 197,206,18,201,173,
    18,201,208,210,32,106,197,76
    ,122,195,173,2333
88  680 DATA 18,201,240,21,169,4
    8,32,202,197,169,44,32,202,1
    97,206,18,1996
F1  690 DATA 201,173,18,201,208,
    238,32,106,197,169,0,32,202,
    197,169,0,2143
A6  700 DATA 32,202,197,165,251,
    133,45,165,252,133,46,32,51,
    165,32,109,2010
70  710 DATA 198,96,160,0,177,65
    ,72,24,165,65,105,1,133,65,1
    65,66,1557
91  720 DATA 105,0,133,66,104,96
    ,165,66,205,141,200,240,7,17
    6,3,76,1783
B1  730 DATA 45,196,56,96,165,65
    ,205,140,200,240,2,176,245,2
    4,96,32,1983
C7  740 DATA 204,255,169,13,32,2
    10,255,32,210,255,169,32,32,
    210,255,32,2365
79  750 DATA 210,255,169,0,32,18
    9,255,169,15,162,8,160,15,32
    ,186,255,2112
C5  760 DATA 32,192,255,162,15,3
    2,198,255,160,0,32,207,255,2
    01,13,240,2249
C3  770 DATA 7,153,73,200,200,76
    ,90,196,169,0,153,73,200,173
    ,73,200,2036
7D  780 DATA 201,48,240,3,76,126
    ,196,173,74,200,201,48,240,3
    8,169,73,2106
BA  790 DATA 160,200,32,30,171,3
    2,204,255,162,15,32,201,255,
    169,73,32,2023
E0  800 DATA 210,255,169,13,32,2
    10,255,32,231,255,104,104,32
    ,228,255,240,2625
BA  810 DATA 251,76,254,193,96,1
    73,19,201,133,99,173,20,201,
    133,98,162,2282
C3  820 DATA 144,56,32,73,188,32
    ,223,189,133,253,132,254,24,
    173,155,199,2260
0C  830 DATA 105,25,133,34,173,1
    56,199,105,0,133,35,160,0,17
    7,253,240,1928
9F  840 DATA 6,145,34,200,76,205
    ,196,96,134,99,169,0,133,98,
    162,144,1897
EE  850 DATA 56,32,73,188,32,223
    ,189,133,253,132,254,24,160,
    0,177,253,2179
26  860 DATA 240,13,140,21,201,3
    2,202,197,172,21,201,200,76,
    238,196,96,2246
A2  870 DATA 165,43,133,97,165,4
    4,133,98,169,0,133,57,133,58
    ,160,0,1588
C0  880 DATA 177,97,200,17,97,24
    0,27,160,2,177,97,133,57,200
    ,177,97,1955
B1  890 DATA 133,58,160,0,177,97
    ,72,200,177,97,133,98,104,13
    3,97,76,1812
98  900 DATA 14,197,24,165,57,10
    5,10,141,23,201,165,58,105,0
    ,141,24,1430
DF  910 DATA 201,96,169,255,32,2
    02,197,169,255,32,202,197,24
    ,173,23,201,2428
1D  920 DATA 105,10,141,23,201,1
    73,24,201,105,0,141,24,201,1
    73,23,201,1746
57  930 DATA 32,202,197,173,24,2
    01,32,202,197,96,173,16,201,
    133,99,173,2151
C7  940 DATA 17,201,133,98,162,1
    44,56,32,73,188,32,223,189,1
    33,253,132,2066
5A  950 DATA 254,160,0,177,253,2
    40,13,140,21,201,32,202,197,
    172,21,201,2284
A9  960 DATA 200,76,131,197,169,
    0,32,202,197,96,169,255,32,2
    02,197,32,2187
D1  970 DATA 202,197,24,173,23,2
    01,105,10,141,23,201,173,24,
    201,105,0,1803
5C  980 DATA 141,24,201,173,23,2
    01,32,202,197,173,24,201,32,
    202,197,169,2192
C8  990 DATA 131,32,202,197,169,
    32,32,202,197,96,160,0,145,2
    51,24,165,2035
15  1000 DATA 251,105,1,133,251,
    165,252,105,0,133,252,96,56,
    165,45,233,2243
6A  1010 DATA 2,133,251,165,46,2
    33,0,133,252,96,142,137,200,
    160,0,185,2135
A8  1020 DATA 255,200,240,7,32,2
    10,255,200,76,239,197,162,0,
    169,46,32,2320
DE  1030 DATA 210,255,232,236,13
    7,200,208,247,162,0,169,157,
    32,210,255,232,2942
1A  1040 DATA 236,137,200,208,24
    7,169,0,141,142,200,32,228,2
    55,240,251,201,2887
DD  1050 DATA 13,240,47,201,20,2
    40,44,201,32,144.239,201,91,
    176,3,76,1968
2C  1060 DATA 58,198,201,192,144
    ,228,201,219,176,224,174,142
    ,200,236,137,200,2930
D7  1070 DATA 240,216,157,178,20
    0,32,210,255,238,142,200,169
    ,0,133,212,76,2658
2C  1080 DATA 26,198,96,173,142,
    200,240,194,206,142,200,169,
    157,32,210,255,2640
11  1090 DATA 169,46,32,210,255,
    169,157,32,210,255,76,26,198
    ,173,157,199,2364
1E  1100 DATA 240,51,173,138,200
    ,133,99,173,139,200,133,98,1
    62,144,56,32,2171
2B  1110 DATA 73,188,32,223,189,
    133,253,132,254,24,173,155,1
    99,105,7,133,2273
28  1120 DATA 34,173,156,199,105
    ,0,133,35,160,0,177,253,240,
    6,145,34,1850
67  1130 DATA 200,76,154,198,96,
    96,173,23,201,24,105,10,133,
    99,173,24,1785
F2  1140 DATA 201,105,0,133,98,1
    62,144,56,32,73,188,32,223,1
    89,133,253,2022
07  1150 DATA 132,254,24,173,155
    ,199,105,16,133,34,173,156,1
    99,105,0,133,1991
C4  1160 DATA 35,160,0,177,253,2
    40,6,145,34,200,76,211,198,9
    6,32,220,2083
11  1170 DATA 197,165,251,141,15
    5,199,165,252,141,156,199,16
    9,255,32,202,197,2876
BA  1180 DATA 169,255,32,202,197
    ,173,23,201,32,202,197,173,2
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    4,201,32,202,2315
2E  1190 DATA 197,162,0,189,254,
    199,240,7,32,202,197,232,76,
    3,199,169,2358
97  1200 DATA 0,32,202,197,32,66
    ,197,162,0,189,158,199,240,7
    ,32,202,1915
D9  1210 DATA 197,232,76,25,199,
    169,0,32,202,197,32,66,197,1
    62,0,189,1975
C2  1220 DATA 185,199,240,7,32,2
    02,197,232,76,47,199,169,0,3
    2,202,197,2216
A6  1230 DATA 32,66,197,162,0,18
    9,228,199,240,7,32,202,197,2
    32,76,69,2128
25  1240 DATA 199,169,0,32,202,1
    97,32,66,197,162,0,189,25,20
    0,240,7,1917
E2  1250 DATA 32,202,197,232,76,
    91,199,169,0,32,202,197,32,6
    6,197,32,1956
89  1260 DATA 166,198,162,0,189,
    67,200,240,7,32,202,197,232,
    76,116,199,2283
76  1270 DATA 169,0,32,202,197,1
    69,0,32,202,197,169,0,32,202
    ,197,165,1965
EA  1280 DATA 251,133,45,165,252
    ,133,46,32,51,165,96,0,0,0,1
    29,32,1530
D0  1290 DATA 76,178,48,32,164,3
    2,66,76,58,67,88,178,48,58,1
    29,32,1330
A6  1300 DATA 68,178,48,32,164,3
    2,49,53,0,135,32,65,58,139,3
    2,65,1150
54  1310 DATA 177,50,53,53,167,1
    53,34,78,85,77,66,69,82,32,8
    4,79,1339
FF  1320 DATA 32,76,65,82,71,69,
    34,59,76,78,170,40,76,172,49
    ,48,1197
C9  1330 DATA 41,58,144,0,67,88,
    178,67,88,170,65,58,151,32,8
    3,65,1355
05  1340 DATA 170,76,172,49,54,1
    70,68,44,65,58,130,32,68,0,6
    6,76,1298
73  1350 DATA 178,32,32,32,32,32
    ,58,76,78,178,32,32,32,32,32
    ,58,946
CE  1360 DATA 83,65,178,32,32,32
    ,32,32,0,135,32,65,58,139,32
    ,65,1012
21  1370 DATA 177,179,67,88,32,1
    67,153,34,69,82,82,79,82,32,
    73,78,1474
0C  1380 DATA 32,76,73,78,69,34,
    59,76,78,170,40,76,172,49,48
    ,41,1171
6C  1390 DATA 58,144,0,130,32,76
    ,58,128,0,0,0,0,0,0,0,0,626
EE  1400 DATA 0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0,0
8E  1410 DATA 0,0,0,0,0,0,0,0,14
    7,17,17,17,32,32,83,84,429
59  1420 DATA 65,82,84,32,65,68,
    68,32,0,13,13,13,32,32,32,32
    ,663
94  1430 DATA 69,78,68,32,65,68,
    68,32,0,0,0,0,0,0,0,147,627
A0  1440 DATA 5,8,17,17,17,32,32
    ,32,73,78,83,69,82,84,32,82,
    743
96  1450 DATA 69,65,68,69,82,32,
    80,82,79,71,82,65,77,32,89,4
    7,1089
94  1460 DATA 78,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0,0,78
D9  1470 DATA 0,0,0,0,0,0,147,5,
    17,17,17,32,32,32,32,83,414
FF  1480 DATA 69,76,69,67,84,32,
    68,73,83,75,32,79,82,32,77,6
    9,1067
98  1490 DATA 77,79,82,89,0,147,
    17,17,17,32,32,77,85,83,84,3
    2,950
4A  1500 DATA 72,65,86,69,32,70,
    73,76,69,32,78,65,77,69,0,14
    7,1080
52  1510 DATA 17,17,17,32,32,70,
    73,76,69,32,78,65,77,69,32,0
    ,756
98  1520 DATA 0,0,0,0,0,0,0,0,0,
    44,65,58,130,32,68,0,397
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FREE CASSETTE

R1-D1

An exclusive arcade game by Tony Crowther is one of the programs on our free cassette.

As an R1-D1 droid you've found your life extremely easy. Patrolling the computer complex, telling the other robots what they should do suits your nature down to the ground. Just as you think you're OK to go for an oil break something goes terribly wrong. The other robots have rebelled against you so you've got to get out.

You start the game positioned at the top left of the complex, your way out to the next level being at the bottom right. However, to get there you must find your way around the rooms using the elevators to get from floor to floor. However life isn't that simple.

Firstly the other robots are out to get you. Fortunately you can shoot back at them destroying both them and their missiles that they have a tendency to fire at you.

Secondly, quite a number of doors within the complex are locked. Before you can go through them you must collect the corresponding coloured key to unlock it. Oh! by the way you can only carry one key at a time.

Once you have managed to leave one level you will find yourself in the next area of the complex. The only difference between this one and the last is the fact that the robots don't give you quite as much time before they come after you.

Controls

Playing the game is quite simple. All control is via a joystick in port two. Each direction has the following operation.

LEFT – move your droid left
RIGHT – move your droid right
UP – move up on a lift
DOWN – move down on a lift or swap the key you are carrying when stood over one of a different colour.
FIRE – shoot in the direction you are facing.

To load the game simply position the tape before the game and press SHIFT and RUN/STOP.

If you are using a C128 don't forget to turn the computer into C64 mode before you run it. YC

Midi Music and You

Ian Waugh brings you MIDI without tears and explains how Commodore owners are the luckiest people in the musical world.

Unless you automatically turn the page at the sight of an acronym or unless you've been holidaying on Mars for the last three years, you must have heard of MIDI. If you have bravely tackled articles about MIDI and are still feeling left out in the cold you may be forgiven for thinking that a conspiracy is afoot to keep MIDI and its secrets out of the hands of the computer-owning public.

The fact is, there has really been no down-to-earth source of information about MIDI and rather than spend (or waste?) a couple of pages explaining what it is, most magazines have plunged straight in with MIDI equipment reviews leaving many readers stranded at the start. Let's try to put that right. Explanations firstl; the reviews will follow in Part Two.

What is MIDI?

MIDI is an acronym for Musical Instrument Digital Interface. It was designed and developed by major musical instrument manufacturers such as Sequential, Roland and Yamaha to overcome the problem of linking together instruments produced by different companies. Each manufacturer has its own individual instrument design and prior to MIDI the chances of mix-and-matching without expensive interface equipment were remote. MIDI laid down rules by which musical information could be standardised in digital form and transmitted and received thorugh DIN sockets. Instruments have at least two such sockets: MIDI IN and MIDI OUT. Many also have a MIDI THRU socket which passes on information received via MIDI IN. This enables you to daisy chain together several pieces of equipment.

In its simplest form MIDI works like this: if you connect the MIDI OUT of keyboard one to the MIDI IN of keyboard two, the first keyboard will transmit musical data down the cable and you will be able to 'play' the second keyboard from the first.

The first keyboard is known as the Master and you could connect other keyboards to the system by using MIDI THRU sockets. MIDI really comes into its own, though, when under computer control. As the signals are digital, what better way to control them than with a computer.

Signals

The nature of MIDI signals sometimes causes confusion. It is important to realise that they are not audio signals but digitals signals, the zeros and ones of computer language. They control the pitch and alter the instrument's performance controls such as pitch-bend, modulation (for vibrato), sustain, volume, velocity, sensitivity (the harder you hit a key, the louder the note) after touch (pressing a key down further after playing it to produce wow or delayed vibrato, etc.) and patch changes.

Not all MIDI instruments have all these facilities and it's important to realise that you can't produce after touch for example on a keyboard which does not have it built-in. Many drum machines and effects units such as echo and reverb now have MIDI so you can put these under computer control, too.

It wouldn't be terribly useful if you coud only control one instrument at a time – a sequencer could do that – so the MIDI specification permits up to 16 different messages to be sent at once. Each message, carrying its own pitch and modulation information etc., is sent on a different channel, and the receiving instruments can be 'tuned in' to the channel you want them to respond to. Actually, MIDI data is transmitted serially so although information on all channels is not technically sent together it's fast enough to seem like it.

When information is transmitted, a code is sent to identify which channel the message is meant for. Most instruments allow you to set the channel they will broadcast and receive on and they will ignore data intended for other channels. Under computer control you will normally allocate a different channel to each musical part e.g. channel one for the bass, channel two for strings, channel three for lead synth, etc. The software will then send the parts to the right instruments.

In Use

It is not essential to know how MIDI works in order to use it and although the principles are quite simple the implementation can appear quite daunting. For example, it is necessary to literally spell out every single operation you want an instrument to perform – much as you must spell out everthing to a computer. There's a MIDI code for turning a note on and one for turning it off. Some operations such as after touch require large amounts of information which can quickly use up the computer's memory. Some software gives you the option of ignoring such memory-hungry features.

Normally the software will take care of all these functions,for you but some programs, especially editing packages, let you get right down to

such nitty gritty. It can be useful and it certainly has its place but many MIDI uses make music quite happily without delving so deep.

The Lingo

Like other aspects of music and computers, MIDI has its own jargon. It is important to distinguish between channels, as previously referred to, and tracks. Tracks works in a similar way to the tracks on a multi-track tape recorder – only you can do more with a MIDI track in a computer than you can with an audio track on tape. Software packages will generally allow you to record on four, six, eight or 16 tracks and each track can be assigned to play on a different channel.

Like audio tracks, MIDI tracks can be merged (or bounced in the case of tape) but unlike audio tracks, they can also be transposed with no alteration in tempo and the tempo can be changed with no alteration in pitch. You can do lots of other things with MIDI data, too, even play a piece backwards, and each software package often has its own specialities.

MIDI modes

There's one more aspect of MIDI control which causes no end of confusion and that is MIDI modes. These affect the way an instrument responds to the channel selection. The two main modes are the ones you are most likely to use. The first is OMNI OFF/POLY mode. In this mode the instrument will receive polyphonic music (i.e. many notes at once) only on its set MIDI channel (one to 16). If OMNI was ON the instrument would pick up data on all channels which could sound like chaos.

The other main mode is OMNI OFF/MONO. This is usually only of use with multi-timbral instruments. Not many of us have 16 instruments to plug into our computer but some keyboards are able to sound more than one voice at once – under computer control – and these are known as multi-timbral. The most well-known and among the cheapest are Casio's CZ range which includes the CZ101 (around £300) and CZ1000 (around £400). Sequential also produce multi-timbral instruments as do JVC and with luck more will continue to appear.

Mono means only one note will sound at a time and in MONO mode, the instrument will play a number of different lines, each with a different voice. Each voice will be receiveing on a different MIDI channel and will play, of course, only one noite at a time. Multi-timbral instruments were made for MIDI and are a fairly cheap way to get started. Typically, as in the channel example, you could program one voice to play a bass line, another to play a guitar lead line, the third could play a string line and the fourth could play arpeggios on a flute.

Plugging In

When we talk of instruments being plugged into the computer, they are not plugged in directly. The connection is made via a MIDI interface, one end of which plugs into the computer, normally the cartridge port on the C64. Depending upon its complexity and sophistication, the interface will contain a number of sockets. The main ones, which all interfaces have, are MIDI IN and MIDI OUT which connect to the MIDI IN and MIDI OUT sockets on an instrument. Many interfaces also have a MIDI THRU which performs the same function as the MIDI THRU on an instrument as described earlier.

Some interfaces have a Sync to Tape socket which allows an audio pulse from a multi-track tape recorder to control the speed of the music so several overdubs can be made on to tape in time with each other. A Clock In enables an external source such as a drum machine to control the speed of the music. These and other controls can often be bought as separate units if your particular interface does not possess them as standard.

Software

There are two main types of MIDI software. The first and most common type allows yoiu to record and play back music. The second kind helps you program the voices on digital synths. Most modern digital synthesisers are not as easy to program as analogue machines. Their parameters are usually displayed as numbers and often you can only alter one parameter at a time. The problem is really only fully appreciated when you start creating sounds yourself.

Voicing Programs give an on screen graphic representation of parameters and often let you alter more than one control at a time. You can usually save the voice to disk; a good way of building up a sound library. You can save a fortune on a plug in RAM packs, often enough to pay for the software. The Yamaha DX range and Casio's CZ synths have benefited most from such packages which are really worth considering if you have one of these synths.

The music-making packages fall into two groups: real-time and step-time. Real time is when you enter notes by playing the keyboard – in real-time, obviously. Step-time is when you enter notes one at a time either from the synth keyboard or from the computer.

Real time is faster but you get everything you play, warts and all. However, you don't need to be a Paderewski or a Rick Wakeman to use real-time software. Thanks to MIDI you can record a piece slowly and speed it up to its correct tempo. You can even play 'impossible' pieces this way and impress your friends no end. If you can't quite get your left hand and right hand to work together, you can record them separately on different tracks and merge them when they are note-perfect. Using similar methods you can record a piece requiring four – or mre – hands to play.

Step-time is obviously more accurate but you need a little patience to put in all the notes. Different software packages take different approaches to step-time input. If you are a musician, you may prefer to enter the notes in traditional notation on a stave. If you are entering music from a written score you may find this advantageous, too.

Other programs adopt a more computer-orientated approach and display note information as a note plus octave number with a value for its duration and a value for its 'on' time, i.e. how long the 'key' is held down. You will also need to enter data such as patch changes and modulation information, something which real-time input normally does as you play. This can take a little getting used to and the non-musician probably has an advantage over the musician here. YC


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Welcome to the Machine

ROM routines revealed. Read on to find out how to input data into your machine code

By Allen Webb

In this article, I want to consider how data can be input into your code by means of the ROM routines.

The trivial method of inputing data is to POKE values into the relevant locations used by the code. This method is good enough and may be mandatory if you're using a Basic driver program and you want to use a compiler. Those of you with more refined taste will want something better.

One of the most important routines in the Basic ROM starts at $AD9E. This evaluates input expressions and checks the syntax. There are a large number of entry points to this routine which can be used for our benefit.

Getting into M/C

There are two commands for the accessing of machine code from Basic. First we have the USR command. It's fuill syntax is:

Variable - USR(expression)

The expression within the brackets is evaluated and stored in FAC/1 (floating point accumulator no 1). This value is then used in your code. The entry point of your code must first be stored in the vector in locations $0310 to $0312. On leaving the routine, the value in FAC/1 is transferred to the variable in the calling instruction. Since you can only pass one parameter, this instruction is of limited value.

The more frequently used command is SYS. This simply calls the machine code starting at the specified address. Since SYS doesn't support parameters, we must use some coding to add them. The most usual syntax adopted is of the form:

SYS address, parameter 1, parameter 2,. . .etc

After your code is entered, the Basic text pointer is pointing at the character after the SYS. We can check this character using four routines:

$AEF7 - check that character is a right bracket
$AEFA - check that character is a left bracket
$AEFD - check that character is a comma
$AEFF - check that character is that held in the accumulator

These routines give a SYNTAX ERROR if the character is not that sought. If the character is correct, the

LISTING 2

```
40 CHKCOMMA = $AEFD
50 CHKLPAR = $AEFA
60 CHKRPAR = $AEF7
70 EVALTERM = $AD8A
80 FLPTOINT = $B7F7
85 CHKCHAR = $AEFF
90 PARAM1 = $AA
95 PARAM2 = $FB
100 JSR CHKCOMMA ; IS 1ST COMMA THERE ?
110 JSR CHKLPAR  ; OPEN BRACKET ?
120 JSR EVALTERM ; YES - GET VALUE
130 JSR FLPTOINT
140 LDA $14      ; AND SAVE IT IN
150 STA PARAM1   ; RESULT 1
160 LDA $15
170 STA PARAM1+1
180 JSR CHKRPAR  ; CLOSING BRACKET ?
190 JSR CHKCOMMA ; NEXT COMMA ?
200 JSR EVALTERM ; YES - GET VALUE
205 JSR FLPTOINT
210 LDA $14      ; SAVE IT IN
220 STA PARAM2   ; RESULT2
230 LDA $15
240 STA PARAM2+1
250 RTS
```

next pointer simply moves on to the next character.

Parameters

Having sorted out the separators, we want to evaluate the parameters. This is readily achieved by calling $AD8A. This evaluates the expression which is being pointed at by the text pointer and stores the result in FAC/1.

Consider the Listing 1:

10 JSR $AEFD
20 JSR $AD8A

This will extract a single parameter after checking for a comma and leave the result in FAC/1. In other words, it checks the syntax:

SYS address, parameter

This sytem is in fact quite tolerant. Spaces are ignored allowing freedom of syntax. The parameter can be any valid expression or a numeric value.

Listing 2 is more complex. It checks for a rather bizarre syntax ie.

SYS address,(parameter 1),parameter 2

You will note that I've used the routine at $B7F7 to convert the parametes in FAC/1 to integers.

You may, alternatively, wish to transfer non-numeric data in strings. Again, there are routines for this purpose. First, we call $AD9E to evaluate the expression. This time, the routine will detect that we have a string and will exit with the length of the string in the accumulator and the start address of the string in $64 and $65. A call to $B6A6 erases any previous copy of the string by moving the string pointers. On leaving this routine, the start address of the string is in $22/$23. Listing 3 handles the syntax:

SYS address, string

LISTING 3

```
20 GETSTR JSR $AEFD ; CHECK COMMA
30 JSR $AD9E        ; EVAL EXPRESSION
40 JSR $B6A6        ; SAVE ADDRESS IN $22/$23
50 STA STRINGLEN    ; SAVE STRING LENGTH
60 LDA $22          ; START ADDREESS OF
70 STA STRINGADD    ; STRING - LSB
80 LDA $23          ; START ADDRESS OF
90 STA STRINGADD+1  ; STRING - MSB
95 RTS
```

This routine will accept text or strings, e.g.

SYS address,A$
SYS address,"text"

The date given by Listing 3 can be easily manipulated. Listing 4 takes this data and moves it to a buffer.

LISTING 4

```
10 LDY #0
20 LOOP LDA(STRINGADD),
   Y
30 STA BUFFER,Y
40 INY
50 CPY STRINGLEN
60 BNE LOOP
```

So what happens if you want to input numeric information during the operation of the program? Well we can use some of the techniques described earlier in this series. Consider listing 5.

The block of lines from 70 to 130 perform the input step and simply get each character and put it into a buffer. You may remember that we've used this before. Line 90 detects the RETURN key and terminates entry when it's pressed. I haven't put a limit on the acceptable length of the input, but it's easily done. The input is terminated with a zero byte.

The buffer used is special in that it's the buffer used by Basic to handle text. Having input our text, we must tell Basic about it and where to find it. First, we put the start address ($0200) of the text into the text pointer used by the CHARGET routine. This is done by lines 160 to 190. We then call the CHARGOT routine in line 200. This puts the first character in your text into the accumulator. We can now call the routine at $AD8A to evaluate the text pointed to by the text pointer. This converts the text to a floating point number in FAC/1. The last two instructions print out the FAC/1 to show that the routine works.

LISTING 5

```
40 BUFFER = $0200
40 CHKSTR = $AD8A
70 LDY #0            ; INPUT ROUTINE
80 LOOP JSR $FFCF    ;
90 CMP #13           ; IF RETURN EXIT
100 BEQ QUIT         ;
110 STA BUFFER,Y     ; PUT INTO BASIC
120 INY              ; INPUT BUFFER
130 JMP LOOP
140 OUT LDA #0       ; TERMINATE INPUT STRING
150 STA BUFFER,Y     ; WITH A ZERO
160 LDA #<BUFFER     ; TELL CHARGET ROUTINE
170 STA $007A        ; WHERE TO FIND
180 LDA #>BUFFER     ; OUR INPUT
190 STA $007B        ;
200 JSR $0079        ; GET CURRENT CHARACTER
210 JSR CHKSTR       ; IS THE INPUT NUMERIC ?
220 JSR $BDDD        ; JUST TO SHOW THAT THE
230 JSR $AB1E        ; ROUTINE WORKS!
240 RTS
```

I've just mentioned a beast called the CHARGET routine, let us consider what it does. When processing, the Basic has to keep track of the text. This is achieved by a short but useful routine which sits in zero page RAM. Listing 6 shows this routine.

When the 64 is powered up, this routine is copied down from ROM. The reason is because the text pointer, which is held in addresses $79 and $7A is incremented by lines 10 to 30 of the

LISTING 6

```
10  $0073 CHARGET INC $7A
20  $0075         BNE CHARGOT
30  $0077         INC $7B
40  $0079 CHARGOT LDA $????
50  $007C         CMP #$3A
60  $007E         BCS OUT
70  $0080         CMP #$20
80  $0082         BEQ CHARGET
90  $0084         SEC
100 $0085         SBC #$30
110 $0087         SEC
120 $0088         SBC #$DO
130 $008A OUT     RTS
```

routine. This is why the address in line 40 is not specified. Lines 70 and 80 check for spaces and ignore them. The rest of the routine checks to see if the character is numeric. If the character is numeric, the routine exits with the carry cleared, else it is set. The accumulator holds the character.

There are two main entry points:
1) CHARGET – this extracts the next character in the text.
2) CHARGOT – this gets the character currently pointed to by the text pointer.

By use of this routine, it is possible to examine text and thereby use more complex commands. Consider the routine. When an command is handled, the test is scanned. If the first

LISTING 7

```
10 CHARGET = $0073
20 CHARGOT = $0079
30 TXTPTR = $7A
40 INITIALISE LDA #$4C
50 STA CHARGET
70 LDA #<WEDGE
80 STA CHARGET+1
90 LDA #>WEDGE
100 STA CHARGET+2
110 RTS
120 WEDGE INC TXTPTR
130 BNE LOOP
140 INC TXTPTR+1
150 LOOP JSR CHARGOT
160 CMP #"@
170 BEQ LOOP1
190 JMP CHARGOT
200 LOOP1 INC $D020
220 INC TXTPTR
230 BNE LOOP2
240 INC TXTPTR+1
250 LOOP2 JMP CHARGOT
```

part of the CHARGET routine were altered so that the routine jumped to your own routine, it would be possible to detect non-standard character sequences and perform actions accordingly. Listing 7 gives an illustrative example.

Lines 40 to 100 insert three bytes into the start of the CHARGET routine. These bytes correspond to JMP WEDGE. This means that every time that CHARGET is called, it immediately jumps to WEDGE. The first thing that WEDGE does is to incrememt TXTPTR. This is necessary since the inserted JMP has prevented CHARGET from doing this. Line 150 gets the next character and we check to see if it was @ . If not, line 190 returns control to BASIC via CHARGOT. If @ was detected, line 200 onwards change the border colour and return control to BASIC. Lines 220 to 240 increment TXTPTR again. This takes the pointer beyond @ so that Basic doesn't notice it and give a syntax error. To use the routine you must remain until the machine is reset. Because we are wedging in a JMP instruction, this sort of routine is called a wedge.

This routine will work both in direct mode (try typing followed by RETURN) and in a program. You can use any command name you like provided you write the code to check it. The only prime need is to use a first character which is not used by BASIC. Obvious examples are @ ,!, >,< etc. The characters after it can be what you like. You could, for example, use @PRINT, !LOAD, > SELF-DESTRUCT etc.

There are two shortcomings with Charget wedges:
1) They are not tokenised so commands will use more memory than usual. Most software using this system have short commands as a result.
2) Since your code will be called each time CHARGET is called, the execution speed of Basic will be slower.

Notwithstanding these faults, the wedge is an easily installed device which is very popular.

I realise that I only have time for a brief description of the functioning of ROM routines. If you want to learn more, you must read some of the better books around. The two I mentioned last time (by Nick Hampshire) are better than most. The news letters issued by ICPUG (Independent Commodore Products Users Group) are also a useful source of information.

Next month I will tackle the floating point routines.

Homework

Last month I set you quite a meaty task. In fact, although the task seems quite large, it's quite simple if you split it into sections. Consider this answer 1.

In order to handle the text, a buffer starting at 830 is used. Lines 1090 to 1130 fill the first ten chancaters with spaces. Lines 1150 to 1270 prompt for an input and put the input into the buffer. Since we're interested in the first four characters of the input and the input could be less than this length, lines 1280 to 1330 pad it out with spaces until four characters are there. Lines 1340 to 1350 terminate the input with a zero byte. This allows use to use the routine at $AB1E to print the word later. Line 1400 to 1580 search the word table for the input and according to the result, a message is output. I'll leave you to sort out the search algorithm. The multiplication in line 1550 and 1560 bump the text pointer by four characters for each entry in the word table.

I'm setting two problems this month but you need not answer both unless you're really keen.

I want to pursue this idea for the first homework question this month. Imagine that you have a piece of text in a buffer starting at location TEXTSTART and terminating with a zero. The length of this text (excluding the zero) is held in location TEXTLEN.

Write a routine which will scan the text and locate words according to these rules:

1) Words are separated by spaces, all other characters are assumed to be part of words.
2) If only one word is found, it is a verb. eg TAKE, EAT

Homework - answer 1

```
1000 *= $C000
1010 BUFFER = 830
1020 CHROUT = $FFD2
1030 CHRIN = $FFCF
1040 PRINTMESS = $AB1E
1050 PRINTNO = $BDCD
1060 COUNT = 899
1070 ;
1080 ;
1090 LDY #0                 ; INITIALISE BUFFER
1100 LDA #32
1110 LOOP5 STA BUFFER,Y
1120 INY
1130 CPY #10
1140 BNE LOOP5
1150 LDA #147               ; PRINT PROMPT
1160 JSR CHROUT
1170 LDA #"<"
1180 JSR CHROUT
1190 ;
1200 ;
1210 LDY #0                 ; INPUT WORD
1220 LOOP1 JSR CHRIN
1230 CMP #13
1240 BEQ LOOP2
1250 STA BUFFER,Y
1260 INY
1270 JMP LOOP1
1280 LOOP2 CPY #4           ; IF WORD LESS THAN
1290 BCS LOOP6              ; FOUR CHARS THEN PAD
1300 LDA #32                ; IT WITH SPACES
1310 STA BUFFER,Y
1320 INY
1330 JMP LOOP2
1340 LOOP6 LDA #0           ; TERMINATE BUFFER WITH
1350 STA BUFFER,Y           ; ZERO
1360 LDA #13                ; CARRIAGE RETURN
1370 JSR CHROUT
1380 ;
1390 ;
1400 LDY #0                 ; INITIALISE WORD COUNT
1410 STY COUNT
1420 LOOP4 LDX #0           ; SEARCH WORD TABLE
1430 LOOP3 LDA BUFFER,X
1440 CMP TABLE,Y
1450 BNE NOMATCH            ; DOESN'T MATCH
1460 INX                    ; IT MATCHED
1470 INY                    ; TRY NEXT CHARACTER
1480 CPX #4
1490 BNE LOOP3
1500 JMP FOUND              ; FOUND IT!
1510 NOMATCH INC COUNT      ; INCREMENT WORD COUNT
1520 LDA COUNT
1530 CMP TABLEN             ; ANY MORE WORDS TO CHECKPRINT
1540 BEQ NOTFOUND           ; NO
1550 ASL A                  ; BUMP COUNTER BY 4 TIMES
1560 ASL A                  ; WORD NUMBER
1570 TAY
1580 JMP LOOP4              ; NEXT WORD
1590 NOTFOUND LDA #<MESS4 ; TELL WORLD ABOUT IT
1600 LDY #>MESS4
1610 JSR PRINTMESS
1620 LDA #<BUFFER
1630 LDY #>BUFFER
1640 JSR PRINTMESS
1650 RTS
1660 FOUND LDA #<MESS1    ; FRIENDLY MESSAGE
1670 LDY #>MESS1
1680 JSR PRINTMESS
1690 LDA #<BUFFER
1700 LDY #>BUFFER
1710 JSR PRINTMESS
1720 LDA #<MESS2
1730 LDY #>MESS2
1740 JSR PRINTMESS
1750 LDA #0
1760 LDX COUNT
1770 INX
1780 JSR PRINTNO
1790 LDA #<MESS3
1800 LDY #>MESS3
1810 JSR PRINTMESS
1820 RTS
1830 ;
1840 ;
1850 TABLE .ASCI "TAKELOOKSINGEAT BITEKILL"
1860 .ASCI "THROLIGHDRINCLIMSWIMFIGHDROP"
1870 TABLEN .BYTE 13
1880 MESS1 .ASCI "THE WORD "
1890 .BYTE 0
1900 MESS2 .ASCI " IS NUMBER "
1910 .BYTE 0
1920 MESS3 .ASCI " IN MY WORD     LIST"
1930 .BYTE 0
1940 MESS4 .ASCI "I DON'T RECOGNISE "
1950 .BYTE 0
```

3) If two words are found, the first is a verb and the second a noun e.g. TAKE SWORD, EAT SKAKE.

Extract the verb and move it to a buffer starting at VERB and put it's length into VERBLEN.

Similarly move the noun to a buffer starting at NOUN and its length into NOUNLEN.

Consider this simple method of text compression. If you use just 32 characters, you only need five bits to save each character. This being the case, you can save three characters in two bytes giving 33% saving in RAM.

Consider this example:

Character 1 — %00011111
Character 2 — %00010101
Character 3 — %%00011011

This compresses to:

Byte 1: %11111101 and Byte 2: %01110110

As you can see, character 1 now occupies the top five bits of byte 1. Character two occupies the bottom three bits of byte 1 and the top two bits of byte 2. Character three occupies bits 1 to bit 5 inclusive of byte 2. Bit 0 to byte 2 is set to zero.

Your task is to:

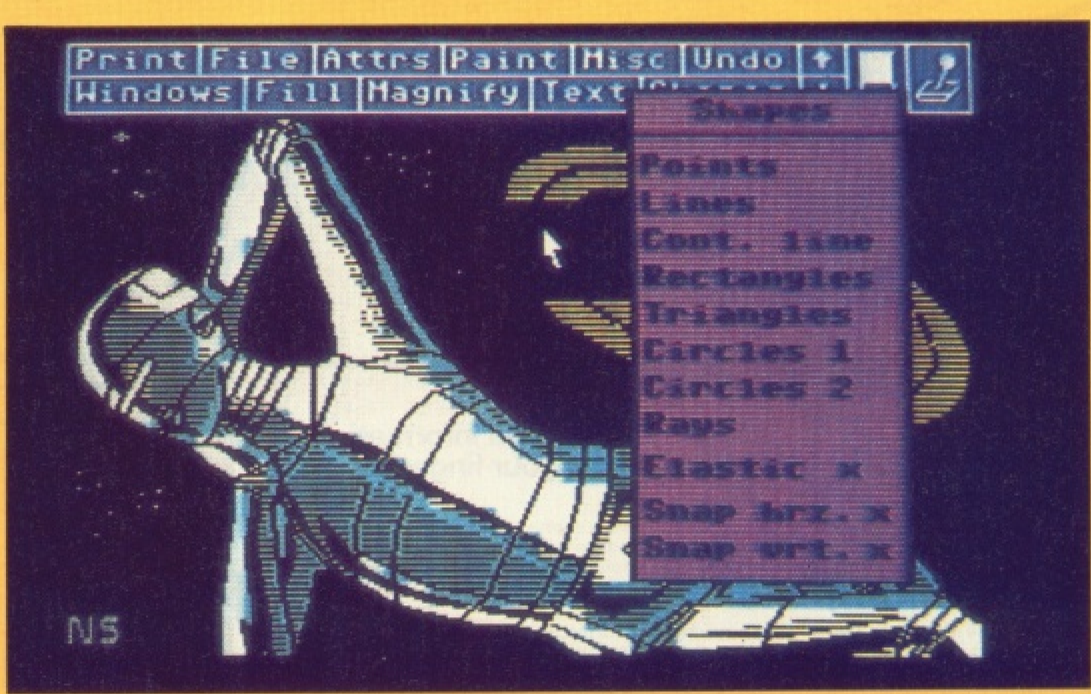
1) Develop an algorithm which performs the compression.

2) Write a routine to do this job using so far as possible logical shifts and rolls and boolean instructions such as OR and AND. YC

Quick on the Draw

Expressing yourself on your C64 is easy with the correct graphics program. Your Commodore takes a look at three new packages.

By Stuart Cooke



No matter where you look, you are bound to see something graphic that was produced by a computer. Computer Graphics are now used in TV, films, advertising, etc. There have even been exhibitions where artists have shown their latest piece of computer art to the public.

Contrary to popular belief you don't need a fantastic, thousands of pounds, computer. In fact you can 'paint' some very interesting and colourful pictures on your humble home micro, whatever it may be.

An artist using standard paints, brushes and canvas must have the correct tools. There's no point in trying to paint a thin line with a brush that is more suitable for poking the fire. The computer artist must also have the correct tools of the trade. A graphics package that he feels comfortable with is a must. All of the options that he should ever require should be present. It must also allow him to use the controller that he feels most happy with, such as a joystick or mouse.

Three new packages have appeared on the market over the last few months, each offering slightly different facilities to the others and different levels of complexity. Below you will find a description of each of the packages and its facilities. Only you can decide what you will require from the package.

The OCP Art Studio

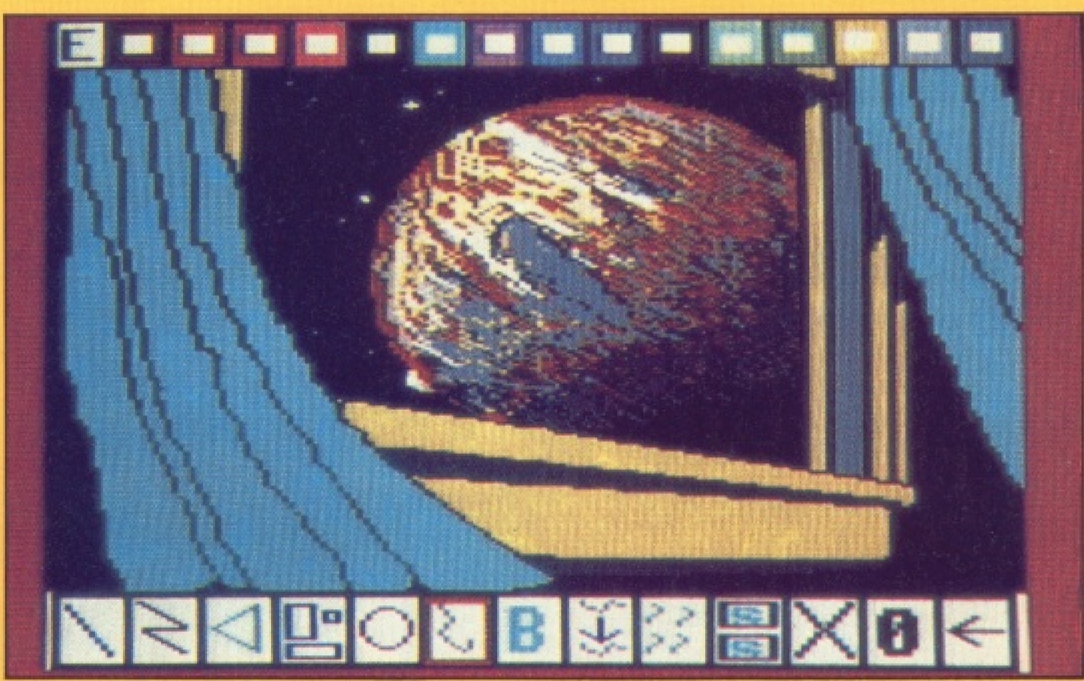
This package is probably the most friendly and well presented package tht I have ever come across. All commands are accessed from a series of pull down menus, rather like those that were made known by the Macintosh computer. For those who have never used pull down menus, you use them like this: The input device is used to move your pointer around the screen. If you move it into the area of the menus at the top of the screen, and press the fire button (or whatever) then the menu that you are pointing at will appear on the screen. You can now move your pointer up and down this menu and choose the option tht you require.

With the *Art Studio* you have a choice of four different input devices. You can use the keyboard, a joystick, a mouse of a Koala Pad to move the pointer around the screen. A nice touch is the fact that the program always displays the device that you are using at the top right of the screen. The reason for this is that you may sometimes have to revert to the keyboard for entering text, etc. This icon stops you from making any mistakes.

Probably the best way to discuss the operation of the program is to deal with each of the menus as they appear across the screen.

Print

The ability to get a hard copy is most important, after all there's no point just having your picture on the screen. This menu allows you to dump your picture to a printer. A separate



program allows you to set up the correct printer. Options inlcude Commodore and Epson compatible printers. Five sizes of printout are available from 1*1 to 5*5. However certain printers can only print certain sizes.

Since your pictures will no doubt be in colour, the option of printing your pictures in grey scale is present. This simply replaces each of the 16 available colours with a shade of grey, this is equivalent to a 3*3 dump. Options are also available to print your picture sideways, at the left of the page, right hand edge or in the middle.

File

This option simply lets you select whether you are using cassette or disk and then allows you to keep your latest masterpiece for future reference.

A facility is present for merging a picture that has been saved with one that is already in memory, though I must admit I've not found a use for this yet.

If you are using disk then a fair range of commands are available to you. It is possible to have up to four different drives connected to the computer, changing from one to the other is simply a matter of selecting DEVICE from the disk pull down menu and changing the number. Commands available allow you to RENAME files, DELETE files, FORMAT a disk, etc.

When using disk, selecting the correct file for use is extremely easy, simply select the LOAD option from the menu and the list of files available will appear in another window. Now move the pointer to the picture that you require press the button and wait until it has loaded.

Attributes

Obviously colour plays a great part in the actual look of your picture. This option allows you to select the ink (foreground) colour, paper (background) colour and the border colour. Once you have chosen an ink you can set it to transparent, this means that you cannot change it when anything is drawn over it. Options also exist to allow you to overwrite existing colours or simply inverse them with the new colour.

Paint

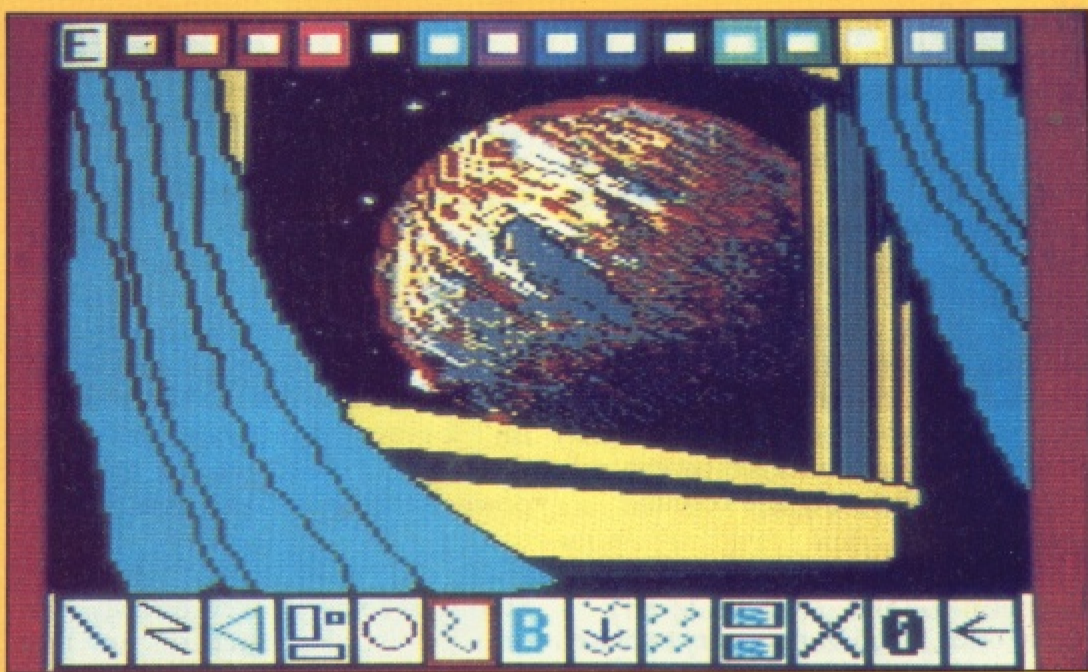
Now we start to get to the fun part. This option allows you to select the type of painting tool that you want to use. Options available are, Pen, Spray can and brush. There are 16 different pens available, each one of a different thickness or angle. Once you have selected the correct pen you can start to draw with it in the drawing area. Eight spray cans are available. Each one having a different density of spray dots, this is great for texturing areas of the screen.

Eight different brushes are available ranging from a dot to a smiling face. One of the brushes is totally blank. This allows you to colour in areas of the screen very easily once you have finished designing a picture in black and white.

If you require a special sort of brush then you can design one with the 'Brush edit' function. This simply allows you to design a brush in whatever shape you require it.

Miscellaneous

This menu offers some extremely useful commands. For a start, since the menus occupy the top two lines of the screen you can only see 22 lines out of 24 at any one time. It is possible to move the screen up and down so that you can get the extra lines. The View Screen option gets around this by removing the menu from the top so that you can see the whole screen at once. Clear Screen speaks for itself and should be used with care since you don't want to lose hours of work. The change colour option is extremely powerful since it allows you to change one ink colour on the screen, or part of it, into another specified colour. Useful if you think the sea in your latest seascape is too dark.



Undo

If like me you're a bit of a klutz when it comes to art then this option will be a life saver. Quite simply UNDO will remove the last operation from the screen. This also comes in handy when trying something out since you can always go back to the last picture if you don't like the effect.

Windows

This is probably the most complex menu of all. A window is basically a box that is defined on the screen which can then be manipulated in some way. Options available allow you to clear a window. You can cut the window out of your picture and move it somewhere else. You can make copies of a window elsewhere on the screen. It is even possible to increase or decrease the size of a window, making that area of the picture larger or smaller. If this wasn't enough you can even rotate the window around as well as flip the section of picture that is in it.

Fill

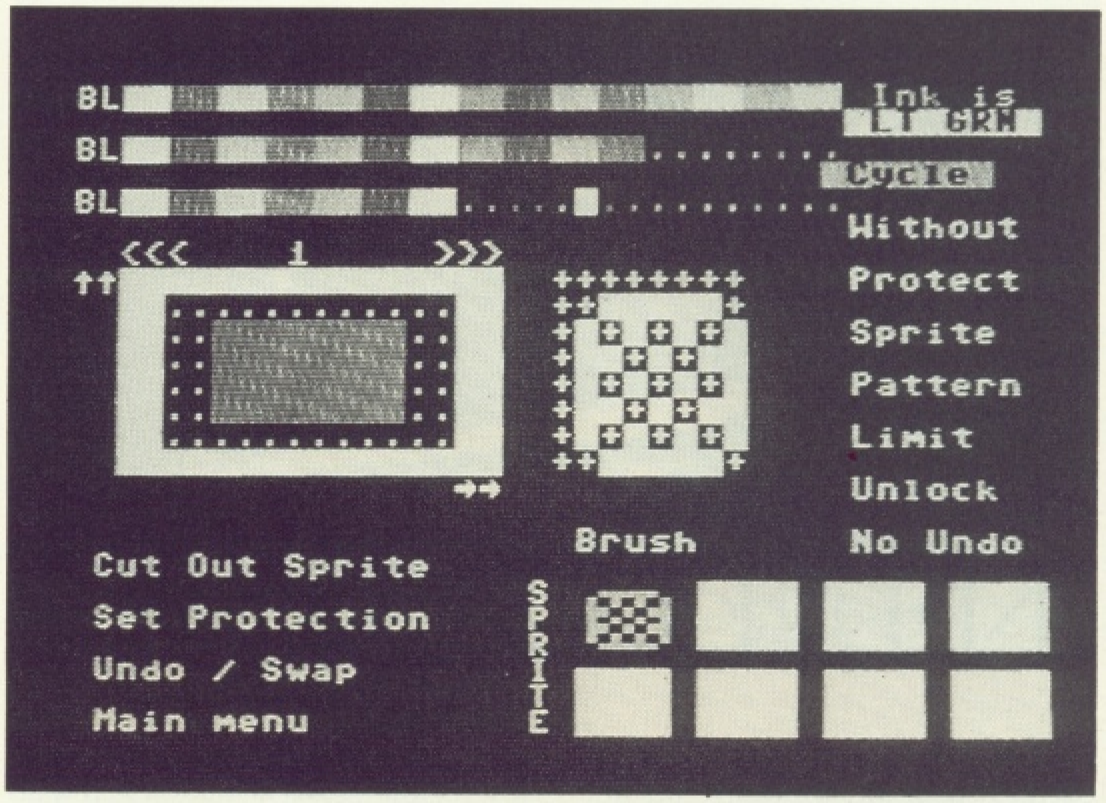
This option allows you to fill or colour in an area of your picture. The solid fill option allows you to fill an area with a solid colour. If you select textured fill you can fill the area with one of 32 different patterns. This could be used to give walls a brick texture, etc. You can also paint with a texture colouring areas of the screen as you pass the texture over it. Just in case you require a special texture and it doesn't appear to be available you can use the edit texture option to design your own.

Magnify

When you draw your picture there will no doubt be areas of the screen that require special attention. The easiest way to make small changes to an area is to magnify it. This means that it is easier to see just what you are doing and where you are placing your colour. The magnify option allows you to blow up an area of the screen by ×2,×4 and even ×8. There is also an option for having a grid behind the picture so that you can have even greater control over where you place the colour.

Text

Quite often it will be necessary to place some text within your picture. The text option offers various facilities. You can print text from left to right or downwards. Your characters can be double or treble height. You can even have double or treble width. If you don't particularly like the font that the characters are in then the Font Editor allows you to design your own.



Shapes

The final menu option allows you to choose from a variety of different shapes/lines for drawing. You can for example simply plot points on the screen. You can draw continuous lines, rectangles, triangles, rays and even circles. An interesting point is that the circles can be drawn in two different ways, you can either specify the radius and then the circumference or vice-versa, the only problem with this is that you tend to forget which option you are using. Again the UNDO option comes in handy if you do make a slip.

The OCP *Art Studios* is probably the easiest to use graphics package that I have ever used on a Commodore computer. What is unusual is the fact that ease of use doesn't mean that it isn't a powerful program. In fact the *Art Studio* is also one of the most powerful graphics packages I have used. Rainbird, who market the program, say that an Advanced Art Studio is being worked on. My only question is what on earth are they going to put in it?

Picasso's Revenge

Originally an American and imported into the UK by Precision Software, this package has one major difference over the others. Its controller is included with the price.

Rather than being controlled by a joystick, etc, this program comes complete with a light pen. If you have never seen one of these before, a light pen is rather like a biro. One end of it plugs into the joystick parts of your computer, you then 'draw' on the screen with the other end. It is worth pointing out that you don't actually draw on the screen, the computer 'looks' to see where your pen is and places a dot on the screen at the relevant point.

Picasso's Revenge has all of the normal facilities that you would expect from a graphics package, though there aren't too many 'fancy' ones.

When loading the program, the first menu allows you to either load a printer program or the graphics package.

The printer program is especially useful as it allows you to load in pictures that have been saved with other programs, for example *Doodle* and *Koala Paint*. In some cases you can even make final alterations with the light pen before you do any print out.

When in the drawing package the menu options appear at both the top and bottom of the screen. These can be removed with the F3 key. Pressing it again will bring them back so that you can change commands.

Going from left to right across the bottom of the screen the following options are available:

Disk Mode

This option allows you to SAVE and LOAD your picture files from or to disk.

Fill Mode

This will fill any enclosed area with either a texture or solid colour. After selecting this option you simply point your pen at the area that you want to fill and away it goes. If the area that you choose for the fill isn't totally enclosed then the fill will not take place. This is extremely useful as on some packages the fill would continue through the slightest gap, obliterating the rest of the picture.

Print

This option is used to dump the current graphics screen to your printer. As with the *Art Studio* the printout uses shades of grey to represent the colours.

Zoom

Magnification of an area of the screen is available with this command. Once the screen is magnified you can scroll around the picture making changes when necessary.

Mirror

This command is great for making pretty patterns. Quite simply everything you draw will be mirrored in both a horizontal and vertical direction, rather like a kaleidoscope.

Focus

In use the actual accuracy of the light pen varies quite a lot, this allows you to alter just how sensitive the light pen is. However, there is a trade off, the higher the sensitivity the slower the actual drawing, etc.

Draw

This is the option that allows you to produce your 'scribble' on the screen. Simply move the light pen around and the ink will follow your pen leaving a trail.

Brush

The width of the brush that is used in the draw option is selected with this command, to the right of this is a window that shows you the width of the brush that is currently in use.

Colour 2

As with *The Art Studio* you have the option of using textures to fill in areas of the screen. This option creates a secondary colour for the textures. Careful use of this command can lead to some extremely interesting shades being displayed on the screen.

Textures

Changing the actual texture that yo draw or fill with is simply a matter of pointing at this box until the texture tht you require appears in the window. Unfortunately if you want to redesign any of the textures you must do this before entering the graphics screen. This can be a problem when you are in the middle of producing a piece of artwork and you suddenly decide that you could use a certain texture in it. Your only option is to save your picture and start the program again.

Shape Menu

Selecting this option brings up another menu on the screen. This menu allows you to select lines, triangles, rectangles, circles, etc. You can even write text on the screen.

Also within this menu are commands that will let you move areas of the screen around, you can copy areas of the screen.

Picasso's Revenge is not the most complex graphics package I have used. However, it is great fun to play with. I can't help thinking that the program is probably more suitable for children rather than an experienced artist. The fact that the light pen isn't quite as accurate as other types of controller may also put some people off.

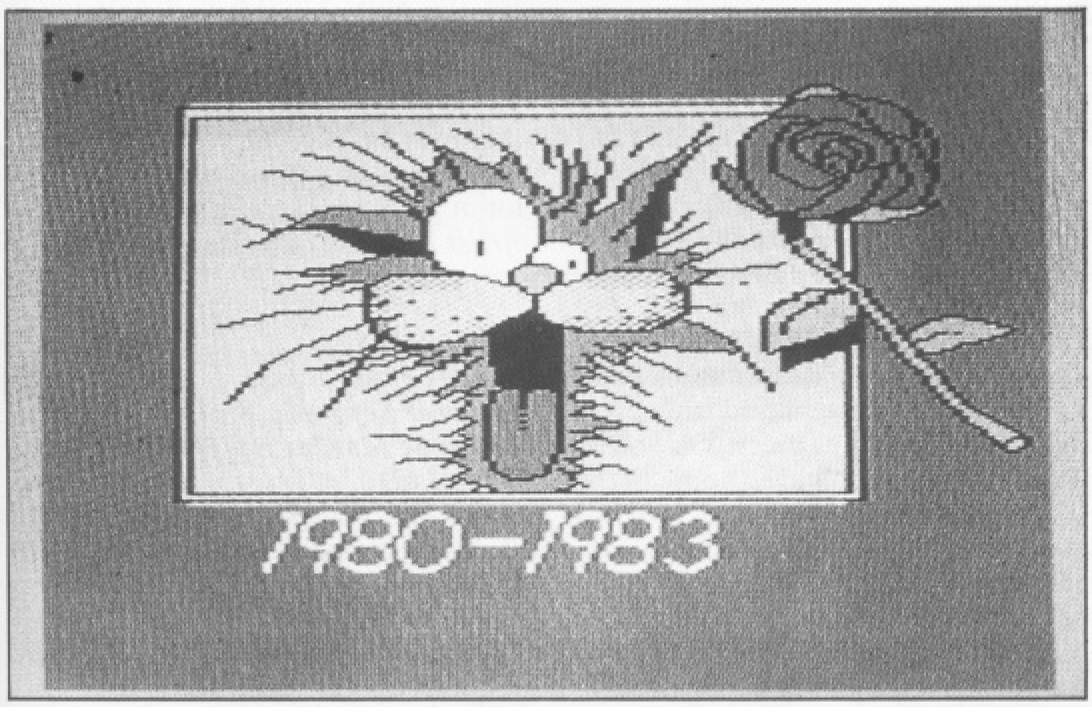
Artist 64

This program from Wigmore is the most complex and most versatile graphics package that I have seen for the C64. It isn't as easy to use as some of the other packages available as there are some extremely powerful commands. However, time spent trying to find your way around the package will be well worth it.

As with the Rainbird package this program can be controlled by a number of different devices. Options available include a mouse (the NEOS or MS2000) or a joystick. My personal preference is to use a mouse, though you do need quite a lot of clear desk space if you wish to use this option.

Artist 64 is menu driven, however, unlike the previous two packages the menus are not present on the drawing screen, you have to swap between screens using the fire button, or mouse. This is actually better since you can see the whole of the drawing area at one time. Three menus are available; these are the I/O Menu which controls actions involving disks, cassettes or even printers.

The Main Menu is obviously the one that you will be using the most often. This is where you will find the





actual drawing commands that you will use to design your pictures.

The final Menu is the SPFX Menu (special effects) this screen gives you the options of designing your own brushes, patterns and even colour cycles. But more of this later.

As you would expect all of the normal drawing commands are available together with a few that are unusual, yet useful. Options are included for drawing freehand, drawing lines, circles, ellipses rectangles, triangles and even polygons. At first you may think that some of the usual commands such as Rays, etc, are missing, however, you'd be wrong.

One extremely powerful command is the RCP option. This remembers the cursor position. When you next draw a line or a shape then you will automatically begin drawing at the previous start position, no doubt you can now see where you get rays from. Using the use last command will cause geometric shapes to keep their dimensions. You can then place the shape wherever you want it on the screen. Useful for details such as windows in houses, etc. Taking this a step further, you can turn on the continuous command. Once this is on you can leave a trail of the shape behind as you move around the screen.

And there's still more. If you turn on the CYCLE option the colour that is being used to draw with at the moment will change, the actual cycle of colours being specified by you in the SPFX menu. Now you can leave a trail of multicoloured shapes behind you. Should you want the shape to be filled in you would simply turn on the SOLID option. As you can see the options are many and extremely varied. Don't forget that many of them can be used with different commands such as circles, polygons, etc.

One extremely useful option is the ability to define an area of the screen as a sprite. Once you have done this you can place your sprite wherever you want on the screen, you can rotate it, place it in front of or behind other colours, you can even use it as a brush to paint in areas of the screen.

Within the SPFX menu it is possible to 'protect' any colour from being overwritten by an other. This is great when you come to adding detail to your pictures. For example, say you had a picture of a castle and wanted to add green grass around it. Simply protect the colours that are used in the castle from being overwritten and whatever you do with your green pen or brush the castle will not be in danger of being 'scribbled' on.

One extremely interesting feature, and one that I have never come across before is the ability to RECORD your drawing actions. You could, therefore, draw your masterpiece with record switched on and watch yourself draw it again at a later date. I'm sure that a facility like this could be useful for demonstrations. You could draw say a picture of a car engine etc. and then label the necessary parts, even make changes when required. Then at a later date you could replay this to your audience. I can't help thinking that this option is quite what would be needed to do this as your audience would have to sit and watch you actually draw the picture and then swap between menus as you label your shape etc.

It would have been better if you could have stored pictures at different stages and then replayed the cycle rather like a set of slides. Obviously this is possible if you keep going to the I/O Menu and saving your picture and at a later date load each one in turn, but I'm sure the record option could have done something like this.

Not every package is perfect, and this one is no exception. One major gripe is the fact that any text entry must be done by pointing at a keyboard that appears on screen. You can't type on the keyboard. The reason for this is that the mouse continually sends information to the computer, much of this seems like a keypress to the computer which would quite happily think you had typed it. This would make your text total jibberish. The on screen keyboard does seem to be the only way out, but it is a bit of a pain.

The text option is extremely powerful and allows many different sizes. The smallest that the text can appear is 5×5 dots. If you really want you can take this right up to a maximum of 160×200 dots, which is very big. You can even print your text down the screen or in italics.

I have only touched on the possibilities that are available with this package. In fact there ae many instructions that I haven't even looked at. If you are serious about your computer art then I suggest that this is one package that you shouldn't be without, it may be complex and take some getting used to but it is the most powerful.

On Your Own

I have only had a look at three of the more recent packages, there are many more available in the shops. If you do want to get into computer art then I suggest that you take a close look at the manual of any package before you buy it to make sure that all the options that you require are there.

Out of the three packages that I have looked at here, *Picasso's Revenge* is by far the simplest to use and as a recent wet afternoon proved, great fun for the kids. The OCP *Art Studio* is extremely well presented, easy to use and very powerful. If you don't already own a graphics package then this may be the one for you. On the other hand if you intend producing a lot of graphics pictures with your C64, *Artist 64* can't be beaten. YC

TOUCHLINE
The OCP Art Studio.
Rainbird Software, Wellington House, Upper St Martins Lane, London WC2H 9DL.
Picasso's Revenge:
Precision Software: 6 Park Terrace, Worcester Park, Surrey KT4 7J7.
Artist 64:
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B R E A K

Break

It's Raining Prizes

There were 10 winners in our US Gold Adventure competition. Here are the names of the lucky readers: Michael Valadez; Brandon, Suffolk; CW Skelton, 13 Signal Regt, BFPO 42; PT Wheeler, Crawley, Sussex; Devji Vekaria, Kingsbury, London; DA Nutting, Weston-Super-Mare, Avon; Iain Pilcher, Raynes Park, London; AP Roberts, Bournemouth, Hants; Kimberly Ross, NY 09255; Jonathan Seymour, Methley, Nr Leeds; John Wright, Barlaston, Stoke-on-Trent. Congratulations to you all.

There were 25 winners in our Berks competition with CRL: Douglas Hooper, Caterham, Surrey; SW Smith, Norton, Kent; Craig Russel, Marown, Isle of Man; HJC Sporle, Didcot, Oxon; Tom Predston, Saltash, Cornwall; Stephen Haig, Morley, Leeds; WOI Rainey JB, Woolwich Barracks, BFPO 36; Andrew Muegett; Cricklewood, London; Mansuhk Patel, Loughborough; RF Briggs, Bodmin, Cornwall; John Stephenson, Maryport, Cumbria; Darren Cairns, Cassop, Durham; W Murphy, Penhill, Swindon; Mark Gascoigne, Doncaster, S Yorks; GR Trump, Southall, Middx; Philip Heneghan, Poulton, Glos; Paul Turner, Standon, Herts; I McCormack, Hull, North Humberside, JA Hudgell, Harlow, Essex; BJ Jones, Bingley, W Yorks; Duncan Hughes, Pettswood, Kent; TS Lim, Swanley, Kent; Leo Carney, Banbury, Oxon; Frances Duguid, Aberdeen, Scotland; Stewart Woods, Goole, North Yorks.



Caption Competition

Amanda Barry of Ariolasoft, one of the leading lights of the software industry, has been having some problems storing the vast amounts of games which reside in the Ariolsoft Covent Garden headquarters. The situation has got out of hand and now she's been totally snowed under as you can see in the photograph.

We decided to come out in sympathy and use the pic for a caption competition. The best three caption writers will each get a crispy fiver so send your entry by Friday 28 November 1986 to *Your Commodore*, Ariolasoft Caption Competition, 1 Golden Square, London W1R 3AB.

Last Word

We hope that you enjoy using the free tape on the front of this month's issue. There are some excellent programs on it which we believe are up to the usual *Your Commodore* standard.

Next month look out for our Christmas Buyer's Guide, packed full of pressie ideas to make a Commodore owner's life really worthwhile.

We'll also be publishing a superb icon program for the C64. Entitled WIMPS, it's a windows icons and mouse program.

Our Christmas issue will contain these and much more for all Commodore owners so don't miss it.

Editor: Stuart Cooke
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Advertisement Copy Control: Laura Champion
Origination: Ebony Typesetting
Design: Argus Design

Your Commodore incorporating Your 64 is a monthly magazine appearing on the first Friday of each month.

Distribution by: Argus Press Sales & Distribution Ltd. 12-18 Paul Street, London EC2A 4JS. Printed by: Alabaster Passmore & Sons Ltd, Tovil, Maidstone, Kent.

Subscription rates upon application to Your Commodore Subscriptions Department, Infonet Ltd, Times House, 179 The Marlowes, Hemel Hempstead, Herts. HP1 1BB.

ISSN 0269-8277

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